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THE UNIVERSITY OF ALBERTA

A STUDY OF THE IMPACT OF AN INTERVENTION PROGRAM ON TEACHER THOUGHT PROCESSES

by

© NEIL BRIAN TUCKWELL

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF DOCTOR OF PHILOSOPHY

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THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled A Study of the Impact of an Intervention Program on Teacher Thought Processes submitted by Neil Brian Tuckwell in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Educational Administration.

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ABSTRACT

Research into the covert mental activity of teachers during instruction is a relatively new area of investigation. This descriptive study which is perhaps the first to address the topic of teacher thought processes from a longitudinal perspective, was conducted for the major purpose of investigating the impact of a planned intervention program on the interactive thoughts of teachers. A second purpose was to investigate the extent to which changes in interactive thought processes of teachers are translated into changes in overt behavior. Further, the study investigated whether the intervention program impacted the preactive thinking of teachers, and whether teacher thoughts or behaviors changed as a result of stimulated recall.

This study was predicated on a model of the teacher as an information processor.

The teachers involved were part of a larger sample participating in a quasi-experimental study designed to investigate the impact on teacher behavior of an in-service program.

With each teacher, stimulated recall was used to elicit data on interactive thoughts in four lessons prior, and in four lessons immediately following the in-service experience, and in a further two lessons one month later. For each videotaped lesson, teacher process data were coded using a multi-faceted observation schedule. Data on the teachers' preactive thoughts were obtained by means of pre-instructional interviews.

Protocols of the introspective reports were analyzed at two levels. At a micro level the interactive thoughts were analyzed using content analysis. A change in the proportion of thought or ideational units across the categories was interpreted as indicating change in interactive thinking. To identify phenomena which characterized the total thoughts of the teacher the protocols were analyzed at a macro level. It was postulated that the phenomena provided insight into the underlying educational philosophy of the teacher and represented the broader context within which interactive thoughts were located.

The teachers displayed marked similarities concerning styles of information processing and the content of the information processed. The majority of teacher thoughts focused on instructional aspects of the lesson, management and control strategies, and perception and interpretation of pupil classroom behaviors and their cognitive and affective characteristics.

Neither widespread nor systematic change occurred in the interactive thoughts of the teachers, and the change which was identified did not occur in cognate areas. While change in overt behavior was both widespread and complex it did not appear to impact teaching skills in a systematic manner.

A lack of congruence between change in interactive thinking and change in classroom behavior suggests the existence of other than a simple correlation between the two variables.

Change in preactive thinking was not contiguous with the intervention program and there was no evidence that engaging in stimulated recall resulted in change in interactive thinking or in overt behavior.

While stimulated recall provides a viable means of studying teacher thought processes from a longitudinal perspective and provides rich data, experience in this study has led to the identification of aspects of the methodology which require further investigation.

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CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

Introduction

The concentration of research effort in teaching in the past twenty years has focused on the overt behavior of teachers and pupils in classroom settings in a bid to establish criteria of teaching effectiveness. Research has been conducted into teacher characteristics, instructional techniques, social climate of classrooms, behavioral objectives, curricula, technology and innovation, contributing to the knowledge of the teaching-learning process enacted in the classroom. This research has basically concentrated on observable teacher behavior. Despite the plethora of research, Dunkin and Biddle (1974:11) raise this question:

> What do we "really" know about teaching? . . . most of the questions . . . have yet to be studied . . . and much of the research on teaching conducted so far does not provide adequate answers.

They continue by asking:

> Where is the knowledge that should constitute the core of teacher training? Where is the empirically based information that represents the science of teaching?

A new orientation in the search for criteria of teacher effectiveness has emerged over the past decade with the increasing awareness of the significance of teacher thought processes. While teacher behavior is an important factor in teaching and learning outcomes, the National Institute of Education (1975), Clark and Yinger (1977), Shulman and Lanier (1977), Clark (1978) and Elstein, Sprafka and Shulman (1978) claim that how teachers behave and what they do is affected by what they think. Smith and Geoffrey (1968) support this, arguing that teaching must be seen as an intellectual cognitive process, for what goes on in the head of a teacher is a critical antecedent of what he does. Teacher cognition is identified by Marland (1977) as an important mediating link between curriculum intent and classroom practice. This relationship between thought and action becomes a critical issue in research on teaching.

Gage (1963) claims that the programs that teachers carry around in their heads need analysis, but Shulman and Elstein (1975) observe that research typically slights the problems of how teachers think about their pupils and instructional problems, concentrating instead on how teachers act or perform in the classroom. Conners (1978) notes that the dimension of teacher behavior that deals with how teachers think, that is plan, make decisions and judgments, and the underlying beliefs and principles that influence these processes, has been a relatively neglected research tradition.

The cognitive information-processing approach to the study of teaching is concerned with teacher judgment, decision making and planning. Berliner (1976) argues that it is the information processing and decision making skills that provide the most important rationale for having human teachers in the classroom. Teaching is portrayed by Shulman and Lanier (1977) as clinical information processing where the teacher as clinician is responsible for aggregating and interpreting a diversity of information. This clinical information-processing approach to research on teaching calls for the study of teachers as gifted practitioners capable of performaces which theory may not yet explain, predict or generate. The "wisdom of the practitioner" becomes a vital feature of the research approach, with teachers not only participating as research subjects but also as sources of insight regarding their own behavior and functioning.

The recent focusing of research interest on the conceptualization or analysis of teaching in terms of the covert thought processes of teachers has addressed the issues of information processing, problem solving, planning and decision making.

Research into teacher thought processes is in its infancy with few studies having been conducted in naturalistic settings. Marland (1977) investigated teachers' interactive thought processes and Conners (1978) focused upon teacher thought processes, beliefs and principles. Cooper (1979) examined information processing in mathematics lessons. This study will describe the impact of an in-service program on the cognitive processes of teachers.

General Statement of the Problem

Shulman (1974:334) claims:

> It will be necessary for any innovations in the context, practice, materials, or technology of education to be mediated through the minds and motives of teachers. This will entail serious studies of the cognitive processes of teachers, their capacities and limitations, in order to develop training programs, decision aids, record keeping technologies, and the like, to further hone the teacher's skills in adapting to learners.

In this context, the main purposes of this study were to:

1. Investigate the impact of an intervention program on interactive thought processes of teachers. This intervention

program, part of a larger quasi-experimental study, took the form of an in-service experience focusing on teaching skills and/or behaviors which have been shown in recent research to be effective in achieving certain process or product goals of classroom instruction.

2. Investigate the degree to which changes in teacher thought processes are translated into changes in teacher classroom behavior.
3. Investigate the impact of an intervention program on the preactive cognitive processes of teachers.
4. Investigate the impact of the introspective technique of stimulated recall on teacher thought processes and teacher behavior.

The specific questions investigated in this study related to five major areas:

1. To what extent and in what manner do the interactive thought processes of teachers change as a result of a planned intervention program?
2. To what extent and in what manner do teachers' overt classroom behaviors change as a result of a planned intervention program?
3. To what extent are changes in the interactive thought processes of teachers translated into changes in a teacher's overt classroom behavior?
4. To what extent and in what manner do the preactive thoughts of teachers change as a result of a planned intervention program?

5. Is there evidence that teacher behavior or teacher thought patterns change as a result of stimulated recall?

Brief Outline of the Study

This study was set in the context of a larger quasi-experimental research project being conducted to investigate the effects on teacher behavior of training in specific teaching skills. While the larger study had as its focus teaching behaviors and classroom practices, this study investigated the interactive thought processes of two teachers.

The quasi-experimental research project involved evaluation of the effects on teacher behavior of an in-service program comprising teaching skills and/or behaviors identified from recent research (and considered in the light of contextual features of the local school district) as being effective in achieving certain process or product goals of classroom instruction.

Using introspective methodology this study involved the collection of the interactive thoughts of two teachers involved in the larger study, with the objective of describing the thought processes and of determing whether change occurred in these as a result of the intervention program.

Ten lessons were videotaped with each teacher for the purpose of stimulating the recall of interactive thoughts. Four stimulated recall interviews were conducted prior to the in-service experience to provide base-line data, and four were conducted subsequent to it to identify change. In order to gain a measure of the stability of any change in the covert behavior of the teachers, two further stimulated recall sessions were conducted one month later.

To aid the analysis and interpretation of the recall protocols and to provide data as a basis for assessing whether the classroom behavior of the two teachers changed over the duration of the study, extensive classroom observational data were collected.

Significance of the Study

To date the main emphasis of research into teaching and teacher effectiveness has focused on teacher and learner behavior within the milieu of the classroom. Investigative studies into the cognitive processes of teachers are only in their infancy and this area of inquiry is emerging as a potentially rich source of information concerning classroom management, instructional strategies, curricula and the receptivity of teachers to innovation.

This study should contribute to this growing body of research knowledge on teacher cognition and information processing, and provide corroborative research support for preceding studies into interactive teacher thought processes.

Information yielded by this study with regard to the use of stimulated recall will contribute to the knowledge of the use of introspective techniques for examining the covert mental processes of teachers during instruction.

Rosenshine and Furst (1973:122) claim that "the research on teaching in natural settings to date has tended to be chaotic, unorganized and self serving." As this investigative study is being conducted within the frame work of a larger quasi-experimental study it should be possible to interpret the data which are generated within the broader context and so contribute to a systematic body of research on teaching in naturalistic settings.

Insight into the impact of a planned intervention program holds significance for the design of both pre-service and in-service teacher education programs. Similarly, understanding of the cognitive functioning of teachers as they process information related to change and innovation is of consequence to the educational administrator.

By addressing the planning phases observed by teachers in the preparation of lessons this study should serve to provide descriptive data of these practices. This could impact teacher education programs.

This exploratory study should generate data from which further research hypotheses can be formulated. To date relatively few studies have been conducted into the cognitive processes of teachers, however this is perceived to represent a potentially significant and emerging research tradition.

Definitions

In this study the following terms are used as defined below:

Content Analysis: is a technique used "for making inferences by systematically and objectively identifying specified characteristics of messages" (Holsti, 1969:14).

Ideational Unit: a remark or series of remarks which expresses a more or less complete idea and serves a specified function.

Interactive: refers to the phase of teaching when the teacher is involved in instructional activity with pupils in the classroom.

Preactive: denotes the phase of teaching which occurs prior to instruction; it may include planning or other forms of preparation for instruction.

Stimulus Point: an incident at which the videotape is stopped in order to assist a respondent to recall thought which occurred concurrently with the incident.

Stimulated Recall: a branch of introspective methodology in which audio and/or visual cues are presented to facilitate a subject's recall of the covert mental activity which occurred simultaneously with the presented cue or stimulus.

CHAPTER II

REVIEW OF THE LITERATURE AND RELATED RESEARCH

This review comprises three sections; the first outlines briefly the emergence of a research tradition in education which addresses the cognitive processes of teachers, the second contains a review of the literature related to the thought processes of teachers in preactive and interactive teaching situations, and the third reviews research methodology pertinent to teacher thought processes.

Review of Literature

In addressing the issue of teacher effectiveness, Good, Biddle and Brophy (1975) observe that more than 10,000 studies have been conducted on the topic and claim that the literature on the subject is overwhelming. Despite this situation they cite the statement by the Committee on Teacher Effectiveness of the American Education Research Association (1953:657) that:

> . . . after 40 years of research on teacher effectiveness during which a vast number of studies have been carried out, one can point to few outcomes that a superintendent of schools can safely employ in hiring a teacher or granting him tenure, that an agency can employ in certifying teachers, or that a teacher education faculty can employ in planning or improving teacher education programs.

Similarly, after reviewing 500 studies which focused on systematic observation of teaching and classroom interaction, Dunkin and Biddle (1974) asserted that little knowledge has been developed by the effort.

Writing recently on the state of research in teaching Yinger (1978:1) reflected:

> Much of the research on teaching in the last 20 years has involved the search for those teaching behaviors that are related to teaching effectiveness. The results of these efforts have been somewhat disappointing in that there have been few teaching behaviors that have been strongly and consistently related to student achievement or student attitudes.

Brophy and Evertson's (1973) claim, that the number of teaching behaviors established as correlates of teaching effectiveness is still limited to a handful, supports this position.

Although concurrence with this general assessment of the impact of the behavioral orientation to educational research is found widely in the literature (Rosenshine, 1970; Moon, 1971; Rosenshine and Furst, 1971; Heath and Nielson, 1974; Shavelson and Dempsey-Atwood, 1976; Winne and Marx, 1977; Shavelson, 1978), this research era and tradition should not be construed as being without value or significance, but rather that a systematic body of knowledge applicable to the classroom has failed to emerge as a consequence of it.

Teacher cognition - an emerging emphasis. An outgrowth of the research that emphasized teacher behavior is the relatively new approach to the study of teaching which focuses on teacher thought processes. This is an approach which is predicated on the assumption that the behavior of teachers is affected by what they think.

Research into how teachers gather, organize and evaluate information is expected to lead to understanding of the uniquely human processes that guide and determine teacher behavior (Clark, 1978). This cognitive information processing view of teaching is perceived by Clark and Yinger (1977b:279) as a logical outgrowth of approaches to research on teaching that emphasized teacher behavior.

> Teacher behavior that is sensible and effective in one setting may be inappropriate in a second, and it is the individual teacher who makes decisions about appropriateness and defines the teaching situation. So if research is to be put into practice - if the general case is to be applied in particular situations - then we must know more about how teachers exercise judgment, make decisions, define appropriateness and express their thoughts into actions.

This stance is supported by Shulman (1974) who argues that because innovation and change in the context, practice, materials or technology of education must be mediated through the minds of teachers, research must address the cognitive processes of teachers.

Winne and Marx (1977:670) give assent to this position:

> We see the mental life of both teachers and students in classrooms as critical items to be studied if we are to understand the process by which teaching influences student learning.

In this regard Walberg (1977) argues that such questions as teacher decision making and thought processes which have been neglected in research on teaching must be taken into account for a complete analysis of classroom learning.

The emerging emphasis is for a research tradition which investigates the cognitive functioning of teachers. This orientation is addressed by researchers (Smith and Geoffrey, 1968; Shavelson, 1973; Shulman, 1974; Whitfield, 1974 Clark and Joyce, 1975) who perceive the need to understand how classroom practitioners do their work; not only what they do, but how they deliberate, judge, make decisions and assess consequences. This approach views the teacher as a clinician.

In 1966, Forehand made the observation that the research on thought processes was either in an early stage of renaissance or in the midst of a fad. The subsequent studies which have been conducted attest to the growing concern for this research area. Earlier reluctance by researchers to investigate the covert mental activity of teachers, Shulman and Elstein (1975) claim, was due to methodological problems and a long standing aversion to the use of introspective data. This opposition is epitomized by Neisser (1968) cited in Elstein, Shulman and Sprafka (1978), who argued, "the very process of thinking aloud alters the content and process of thought." Radford (1974) however alleges that introspection provides information about experience, yielding data which is otherwise inaccessible, or as Smith and Geoffrey (1968:96) observe, "aspects of teaching which are frequently lost to the behaviorally oriented empiricist."

The cognitive approach to research in teaching is not an independent research thrust but is an outgrowth of the research which focused on classroom behavior. Shulman (1974:335) implies that a symbiotic relationship will emerge between the behavioral and cognitive traditions.

> Although good experimental and correlational investigations will continue to be useful we need add more varied kinds of studies - longitudinal case studies, anthropological analysis of classrooms and teachers, information-processing modellings of the thought processes of teachers and learners using methods of controlled introspection and retrospection . . . .

A potential aspect of the relationship between the behavioral and cognitive research traditions is perceived by Forehand (1966:381):

> Frequently when the behavioristic and information-processing approaches clash it is over the proper strategy for scientific inquiry. The operant analyst regards conceptions of internal processing as dangerous; the information-processing theorist regards the search for S-R associations as sterile. Here the precepts of each point of view can serve as healthy correctives for the excesses of the proponents of the other.

Teacher Thought Processes

Over recent years there has been a slow but discernible increase in the number of articles in the literature in which teaching is conceptualized or analyzed in terms of the covert cognitive processes of teachers. In this context several metaphors have been generated to describe various aspects of teaching. The teacher has been conceptualized as an information processor (Ryans, 1963; Shulman, 1974; Shulman and Elstein, 1975; National Institute of Education, 1975; Clark and Peterson, 1976; Shulman and Lanier, 1977; Clark, 1978), a problem solver (Joyce and Harootunian, 1964), a planner (Taylor, 1970; Zahorik, 1975; Clark and Peterson, 1976; Marland, 1977; Yinger, 1978) and a decision maker (Dettre, 1970; Bowles, 1973; Shavelson, 1973; Clark and Joyce, 1975; Marx and Peterson, 1975; Morine, 1975b; Marland, 1977). Whatever metaphor is used, Clark and Yinger (1977b:280) claim, "the mental processes that underlie the behaviors are always the focus of study."

Teacher as Information Processor

Ryans (1963) portrays the teacher as an information processing system functioning for the purpose of assisting pupils acquire appropriate behavior repertoires. He defines information processing by teachers as the selection, the preparation for transmission and the forwarding or communication of some meaningful message, in "overt and directly observable 'information forwarding' responses which are directed at the pupils" (1963:274). He hypothesizes that teacher information processing involves a five-phase sequence of activities consisting of:

1. sensing, identifying and classifying both internal and environmental inputs;
2. evaluating possible courses of action in light of relevant circumstances;
3. decision making, involving selection of appropriate information content, media and transmission channels;
4. programming, or ordering and arranging, of intended information output;
5. transmission of appropriate information via appropriate channels, or teacher behavior.

In identifying the significance of the teacher as information-processor, Ryans represented the cognitive processes of the teacher in an ends-means model of rational thought.

The emergence of information processing theories of human problem solving expressed as computer programs that simulate behavior is commented upon by Newell (1966), Forehand (1966) and Green (1966) who note the argument by researchers that "computer programs could serve as exact, unambiguous theories about the way humans process information" (Green, 1966:3).

A two model concept of research on teacher thought processes is presented by Clark (1978); a decision-making model and an information-processing model. In the latter he portrays the teacher as a person faced by a complex task environment within which he copes by simplifying the environment by attending selectively to some aspects and ignoring others. Clark terms the simplified portion of the task environment a problem space. The central issue in this information-processing approach focuses on how the information processing capacity of the teacher limits and influences the ways in which the complex task environments are simplified into problem spaces, and how the definition of particular kinds of problem spaces influences subsequent teacher thinking, classroom interaction and student learning. This model focuses on how the teacher limits and structures the environment in which he is to act; an environment characterized by fast-paced interaction. Shavelson, Atwood and Borko (1977) report research to support this model, noting that people use simplifying strategies in choosing and integrating information in order to make judgments.

Teachers deal with a large amount of information about their students, drawn from many sources. Because this may result in information overload, Borko, Cone, Russo and Shavelson (1978) hypothesize that teachers pay attention to a small portion of the information available by combining it into a limited number of categories. Dill (1964) posits that on the basis of the success of operations research models and from the heuristic models of problem solving, that relatively simple "images" of the world can serve effectively as the basis of prediction and action.

Shulman (1965) suggests that in the "real world" individuals move through an array of stimulus situations which are potentially problematic in varying degrees, selectively reacting to some and not to others. Those situations which are problematic do not present themselves one at a time in a pre-determined numerical order, but derive both their definition and the order in which they are handled from the cognitive activity of the individual.

Clinical information processor. On the basis of research designed to investigate the cognitive processes involved as physicians carried out diagnosis, Shulman and Elstein (1975) reflected on the similarities between the roles of the teacher and the physician, claiming:

> The teacher's role can be conceptualized like a physician's role, as an active clinical information processor involved in planning, anticipation, judging, diagnosing, prescribing and problem solving (1975:35).

This view of the teacher as a clinical information processor is supported in the writings of Shulman (1974), Clark and Peterson (1976) and Shulman and Lanier (1977).

With respect to this orientation the conference panel of the National Institute of Education (1975) adopted the following postition:

> The panel was oriented toward the teacher as clinician, not only in the sense of someone diagnosing specific forms of learning dysfunction or pathology and prescribing particular remedies, but more broadly as an individual responsible for (a) aggregating and making sense out of an incredible diversity of information sources about individual students and the class collectively; (b) bringing to bear a growing body of empirical and theoretical work constituting the research literature of education; somehow (c) combining all that information with the teacher's own expectations, attitudes, beliefs, purposes . . . and (d) having to respond, make judgments, render decisions, reflect, and regroup to begin again.
> (NIE Conference Report, 1975:2).

This conceptual model for clinical information processing in teaching is represented in Figure 1. In this model of teaching the NIE panel conceived the teacher as performing a professional role quite parallel to those of physicians, lawyers, and military strategiests as they "employ . . . information to reach diagnostic judgments and make prescriptive decisions as they attempt to respond appropriately to each student (NIE, 1975:10).

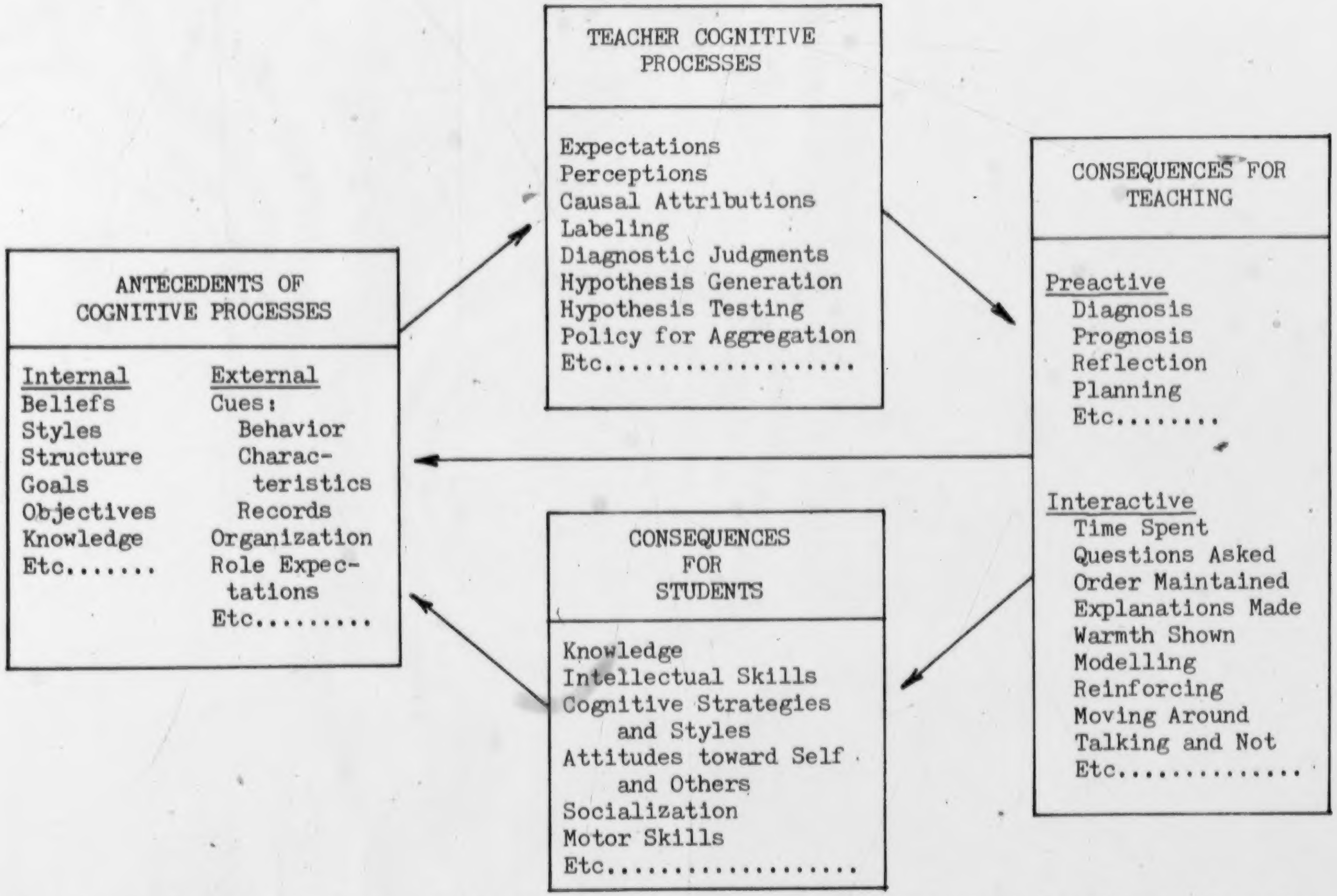
ANTECEDENTS OF COGNITIVE PROCESSES
Internal
Beliefs
Styles
Structure
Goals
Objectives
Knowledge
Etc.......
External
Cues:
Behavior
Characteristics
Records
Organization
Role Expectations
Etc.........
TEACHER COGNITIVE PROCESSES
Expectations
Perceptions
Causal Attributions
Labeling
Diagnostic Judgments
Hypothesis Generation
Hypothesis Testing
Policy for Aggregation
Etc...................
CONSEQUENCES FOR TEACHING
Preactive
Diagnosis
Prognosis
Reflection
Planning
Etc........
Interactive
Time Spent
Questions Asked
Order Maintained
Explanations Made
Warmth Shown
Modelling
Reinforcing
Moving Around
Talking and Not
Etc.............
CONSEQUENCES FOR STUDENTS
Knowledge
Intellectual Skills
Cognitive Strategies and Styles
Attitudes toward Self and Others
Socialization
Motor Skills
Etc...................

Figure 1. A General Conceptual Model for Clinical Information Processing in Teaching and Learning.

(Source: National Institute of Education, 1975:5)

Clark and Peterson (1976) report that the term "clinical information processor" is intended to communicate two perspectives; a view of the task of teaching as fundamentally clinical in nature, and a view of the human being who performs those tasks as an information processor. Shulman and Elstein (1975) argue that information-processing theory purports to be a theory of the processes by which humans reach judgments and solve problems. The information-processing approach is avowedly isomorphic in intention, aiming to provide an explanation of human thought using more elementary processes, operations or capabilities.

Bounded rationality. While the issue of human rationality will be considered in the context of decision making, it is appropriate in regard to information processing to note some evidence from the literature which suggests that humans behave with limited or bounded rationality (Newell and Simon, 1972).

Shulman and Elstein (1975:35) claim that "the teacher is expected to function in a task environment containing quantities of different kinds of information that far exceed the capabilities or capacities of any human information processor." From studies into medical enquiry Shulman and Elstein (1975) and Elstein, Shulman and Sprafka (1978) found that physicians generate a small set of hypotheses very early in the clinical encounter based on a small number of cues obtained early. These hypotheses define the problem space of possible solutions, and subsequent data are used to evaluate these hypotheses.

Evidence suggests that human subjects do not investigate possibilities, plan or problem solve in the systematic way suggested in the traditional ends-means model. In this regard Miller (1956:95) asserts that "the span of absolute judgment and the span of immediate memory impose severe limitations on the amount of information we are able to receive, process and remember."

From his investigative study into life in classrooms it was Jackson's (1968) observation that not only is teacher talk characterized by conceptual simplicity but that there exists a tendency for teachers to approach classroom events intuitively rather than rationally. He reported that many ". . . declared that their classroom behavior was based more on impulse and feeling than on reflection and thought" (1968:145). Caution should be exercised in interpreting these self reports, for the impulses and intuitive hunches had been tempered by years of practical experience, suggesting that the basis of the teacher's action might be more rational than their self reports indicate. Despite this, Jackson (1968:151) concluded:

> . . . the activities assumed to accompany rational thought processes . . . such as the identification of alternative courses of action, the conscious deliberation over choice, the weighing of evidence, the evaluation of outcomes - these and other manifestations of orderly cognition are not very salient in the teacher's behavior . . . .

Uncertainty and unpredictability are features within the classroom environment which restrict the usefulness of a rational model for explaining teacher actions. In respect of this Yinger (1978) claims that the rapidity and immediacy of teachers' interaction preclude the rational, purposeful kind of thinking normally associated with problem solving and decision making.

In relation to the issue of human rationality Goldberg (1968) reports that clinical judgments tend to be rather unreliable, being only minimally related to the confidence and to the amount of experience of the judge, relatively unaffected by the amount of information available and rather low in validity on an absolute basis.

One consequence of the property of bounded rationality identified by Elstein, Sprafka and Shulman (1978) is that it is necessary to process data serially. This entails careful selection of the data and the representation of the clinical problem in a simplified problem space.

Research into information processing attempts to capture in detail the intellectual processes used by subjects as they attempt to solve problems, reach decisions or make judgments. In such process-tracing approaches introspective reports are obtained from subjects using stimulated recall, think aloud or self report techniques and the verbal protocols are analyzed to determine the characteristics of the intellectual processes of the subject. Such research has been conducted into medical enquiry (Sprafka and Elstein, 1974; Shulman and Elstein, 1975; Elstein, Shulman and Sprafka, 1978; Elstein, Sprafka and Shulman, 1978), teaching and learning (Bloom, 1950; 1953; 1954; Gaier, 1954; Marland, 1977), chess (de Groot, 1966) and problem solving in chess, symbolic logic and cryptarithmetic (Newell and Simon, 1972).

In this study introspective methodology is used in order to investigate the impact on the interactive thoughts of teachers of a planned intervention program designed to acquaint teachers with information related to recent research findings.

Teacher as Problem Solver

Problem solving behavior is explained by Newell, Shaw and Simon (1958) in terms of information processing. They claim a similarity among programs employed in the solution of problems and argue that "if there were no such similarities, if each subject and each task were completely idiosyncratic, there would be no theory of human problem solving (1958:152). They argue that computer programs could serve as exact, unambiguous theories about the way humans process information to arrive at solutions.

Joyce and Harootunian (1964) portray teaching as problem solving behavior, claiming that a teacher faces an educational problem each time it is perceived that an educational objective is to be achieved. Their reasons for developing this approach were firstly heuristic and represented an attempt to break away from the concept of teacher effectiveness which they perceived as having had a binding effect on research in this area. They argued against the use of observer rating scales as a means of assessing teacher effectiveness on the grounds that even the most carefully constructed scales obscure the intellectual processes, the background knowledge and the procedures the teacher brings to bear on the professional problems he faces. They claimed that what is needed is not so much an assessment of the way the teacher interacts with the children as the intellectual processes which result in that interaction.

Their second reason for identifying teaching with problem solving activity was to justify the examination of behavior relevant to teaching under laboratory conditions where some control over variables could be exercised. They analyzed the teacher's problem solving act into several components among which were goal setting, diagnosis, selecting materials and utilizing behavioral outcomes.

Research conducted by Joyce and Harootunian investigated the problem solving behavior of teachers during preactive planning using a simulated task. The teacher's ability to derive objectives and teaching procedures, to organize procedures, to derive evaluation procedures and to obtain and use knowledge to approach these four tasks was interpreted as a measure of problem solving ability. It was found that few teachers used a behavioral analysis as they prepared their lessons, and that most depended heavily on instructional materials for selection of method, content and sequence of activities.

Reporting more recent research into teachers' interactive thoughts Marland (1977) notes that very little of the teachers' interactive thinking fits the problem solving paradigm.

Teacher as Planner

While the intellectual processes employed by a teacher in the act of planning are integrally meshed with his total preactive thought processes and decision making, for the purpose of this review the function of the teacher as a planner will be considered separately. Emphasis will be placed on the planning strategies, which in turn will provide a frame of reference for later consideration of preactive decision making.

Jackson's (1968) portrayal of teacher planning as a special example of problem solving behavior is supported by Yinger (1978) who claims that the planning phase of teaching is one place where the notion of the teacher as problem solver and decision maker may have most descriptive power. This view is not shared by Morine (1973, 1975a) who argues that much of the planning that teachers do is never perceived by them as a problem to be solved. She claims that it is simply a routine activity.

The planning phase is characterized by Shavelson (1976) as a problem in instructional design, and the decisions taken in this process he claims "may be the most important ones teachers make" (1976:392), because of the time available for the teacher to ponder. He identifies the following stages in instructional planning:

1. specifying the outcomes of instruction;
2. specifying instructional design alternatives;
3. specifying students' entry behavior;
4. estimating the outcome of each combination of an instructional alternative and state of nature;
5. choosing the optimal course of action;
6. evaluating instruction by observing student behavior (Shavelson, 1976:396).

The rational model of planning, Yinger (1978) claims, has been adopted by education from planning models from economics and national and city planning theory. This rational choice model is characterized by:

1. setting of goals;
2. formulation of alternatives;
3. prediction of outcomes for each alternative;
4. evaluation of each alternative in relation to the goals and outcomes (Yinger, 1978:4).

Yinger observes that in educational planning this approach to decision making has been most popularly advocated in a model of curriculum planning first proposed by Tyler (1950) and later elaborated by Taba (1962) and Popham (1970) into the following rational ends-means model for curriculum planning:

1. specification of objectives;
2. selection of learning activities;
3. organization of learning activities;
4. specification of evaluation procedures (Yinger, 1978:4).

Advocates of the integrated ends-means model claim that planning commences with the identification of activities from which objectives arise and exist only within the context of the activity. Zahorik (1975) reports research which suggests that the integrated ends-means model does not appear to be a functioning reality, for only 3 percent of a sample of some 200 teachers reported beginning planning by making decisions about activities.

In reference to the rationality of teacher planning, Morine (1975a:2) contends that "there is a wide gap between the highly rational, logical behavior envisioned by educational theorists as the epitome of effective educational planning, and the kind of routine management behavior that teachers actually engage in when they are planning lessons." Teachers' ability to execute the planning stages of generating alternatives, selecting among the alternatives and altering existing circumstances is discussed by Morine (1975a) in terms of the Piagetian stages of development.

To determine how teachers actually approach lesson planning, Clark and Yinger (1977a) contend that there is a need for description of observable behavior together with reports of teacher thought processes occurring during planning. Marx and Peterson (1975), Clark and Joyce (1975) and Clark and Peterson (1976) report research in which twelve teachers planned and taught social studies lessons. During the planning phase the teachers used the "think aloud" technique to report their thought processes, and stimulated recall sessions were conducted on videotaped segments of the lessons to enable the teachers to recall their interactive thought processes related to alternative actions or strategies and the implementation of the lesson plan. Yinger (1978) reports unpublished findings by Peterson, Marx and Clark generated from the above research which show that the greatest proportion of planning time was spent on content, followed by instructional processes. Conspicuously absent was the time spent considering objectives (0.04 percent).

An analysis of the planning decisions made by 194 teachers drawn from large metropolitan schools enabled Zahorik (1975) to report that the planning decision made by most teachers (81 percent) was related to activities, but that this decision was made first by only 3 percent of the sample. The planning decision made first by the largest number of teachers (51 percent) concerned lesson content and this was identified as one of the planning decisions by 70 percent. Decisions about objectives were noted by 56 percent of the teachers, but only 28 percent reported them as their first planning decision. In reaction to this, Zahorik asserts that the common practice of identifying content first would be rejected by curriculum theorists because it serves to make content an end in itself rather than a means to an end.

Support for Zahorik's (1975) findings is drawn widely from the research literature. Clark and Joyce (1975) report that teachers do not generally employ behavioral objectives. Taylor (1970) found from research in Britain involving 261 teachers, that teachers began planning by considering the context (materials and resources) of the teaching, followed by consideration of the learning situations likely to interest and involve the pupils, and only after this did they consider the purpose their teaching would serve.

From an ethnographic study conducted over a five month period Yinger (1978) describes the mental processes involved in teacher planning decisions, concluding that the most prominent and frequent planning concern was activities (which subsumed content and materials). Behavioral objectives were not a central part of teacher planning.

The significance of teacher planning activity is addresssed by Marland (1977) who observed from his study of teacher thought processes, that the act of planning a lesson serves to program the teacher in a predetermined way, but that plans did not impinge on teacher interactive thoughts until disruptions occurred which jeopardized the implementation of the plan. He reports that lesson plans were implemented without any major changes being made.

The preactive decision making of teachers will be investigated in this study in order to describe such practices and to assess the impact of a planned intervention program on teacher planning.

Teacher as Decision Maker

Yinger's (1978) claim that it has become popular to characterize the teacher as an information processor and decision maker is attested to by the recent emphasis in the literature on the decision making skills of the teacher. Whitfield (1974) states that teachers are unavoidably extensive choice makers; Bowles (1973) argues the critical nature of the teacher as decision maker; and Mosston (1972:10) expresses the view that "teaching behavior is a chain of decision making," suggesting that everything a teacher does and says is a result of a decision previously made. He claims that every act, statement or question of a teacher is the consequence of such a decision. This view is supported by Shavelson (1973:144) who states, "any teaching act is the result of a decision either conscious or unconscious."

In similar vein Shavelson, Cadwell and Izu (1977) note that teaching has been modelled as a decision making process and Shavelson (1973) claims that decision making is the most basic teaching skill, arguing that decision making pervades teaching.
Shavelson (1976:372) states:

> Decisions - sometimes conscious, but more often not - are involved in almost every aspect of a teacher's professional life, especially in planning, implementing and evaluating instruction. Most, if not all teaching, then, is based on decisions made by the teacher after complex cognitive processing of available information.

Shavelson cautions that this characterization of the teacher as a decision maker is ideal and that it probably attributes more rationality to the teacher's behavior than is warranted.

Although the concept of the teacher as a decision maker is widely embraced in the literature, limited research has been conducted to provide an empirical basis for the theorizing. Marx and Peterson (1975) comment that research on teacher decision making is a relatively untapped topic. Similarly Shavelson (1973) and Whitfield (1974) note that while research has provided a great deal of knowledge about what teachers do "there is little empirical information about how teachers make choices and decisions in the classroom, of points at which they perceive a choice, and of the mechanisms and determinants of choice and action under pressure of time" (Whitfield 1974:85).

Research by Taylor (1970), Zahorick (1975), Clark and Peterson (1976), Marland (1977) and Yinger (1978) into preactive decision making has been considered in the previous section dealing with the teacher as a planner. Few studies (Morine and Valance, 1975; Marx and Peterson, 1976; Marland, 1977) have been reported which consider interactive decision making. Marland's (1977) research highlights the limited number of interactive decisions that teachers report making and the small number of alternatives considered in making interactive decisions.

Decision making. Decision making in teaching according to Clark and Joyce (1975), is a matter of identifying, selecting and coordinating educational objectives, student characteristics and learning environments. In this situation the teacher is cast by Shavelson (1976) and Borko, Cone, Russo and Shavelson (1978) as an active agent who selects a teaching skill or strategy from a set of alternatives in an attempt to reach a goal or set of goals. In their ethnographic study Smith and Geoffrey (1968) explored decision making as a process for establishing the social system of the classroom. Their findings supported the stance that much of the teacher's conscious efforts were related to the development of a coherent social system.

Models of teacher decision making. As noted earlier, Clark (1978) presents a two-model concept of research on teacher thought processes; a decision-making model and an information-processing model.

In the decision-making model Clark (1978:2) represents the teacher as:

> . . . a decision maker who is constantly assessing the situation, processing information about the situation, making decisions about what to do next, guiding action on the basis of these decisions and observing the effect of these actions on students.

In respect of this, Clark and Yinger (1977b) caution against a too ready acceptance of the multi-phase ends-means model of rational thought, by raising the question of the fraction of teaching that is reflective and that fraction which is reactive.

Perhaps the most detailed exposition of the view of the teacher as a decision maker is that presented by Shavelson (1976) who characterized teacher decision making as decision making under uncertainty. He used concepts from statistical models of decision making to analyze decision making in teaching, but noted that such models apply to situations in which sufficient time is available to carry out the hypothesized steps in the process. This situation does not often prevail in the classroom setting.

Five features of decision making in teaching were identified by Shavelson (1976:374):

1. choice of a teaching act from alternative acts;
2. states of nature (environmental conditions not directly under the teacher's control);
3. outcome of a particular course of action under a particular state of nature;
4. utility of outcome for the teacher;
5. goal or set of goals the decision is intended to help attain..

Shavelson (1976:401) characterizes teachers as "rational decision makers who intuitively use evaluative information for estimating probable students states of nature and the utility of using alternative teaching methods in the presence of these various states of nature." He claims, however, that teachers may not be rational decision makers when removed from the laboratory situation and placed in the classroom with the responsibility for teaching a class of children.

A comparison between the decision making models for economic, military, industrial and instructional decisions, is drawn by Bowles (1973) who concludes that teachers utilize decision making at a different level. He highlights the following features of teachers' decision making:

1. there exists a minimum threat of overt physical danger to teachers or students due to error;
2. there is no immediate feedback of costs, therefore the impact of uneconomical decisions is diminished;
3. teachers escape direct responsibility for some inadequate decisions due to a lack of a readily observable measured product (Bowles, 1973:38).

A different level of risk taking emerges because the time for deliberation is comparatively brief in the classroom situation. As Whitfield (1974:85) states, "within the pressure of the classroom which presents an ongoing cavalcade of stimuli, there are many occasions when potential options cannot be consciously scanned or filtered."

Categorization of teachers' decisions. It is suggested within the literature that a teacher's decision making varies with the context in which it occurs. The two-way categorization developed by

Jackson (1968) in which he labelled decisions taken before a lesson as preactive and those occurring within the lesson as interactive, has been widely adopted.

Two broad classifications of teacher decisions were identified by Dettre (1970), which he described as tactical decisions (those related to the immediate situation for which there will be immediate feedback from the consequences produced by the decisions) and strategic decisions (decisions growing out of an immediate situation but related to some future-time orientation). Within these he postulated that teachers make qualitative decisions, action decisions and quantitative decisions.

The classification proposed by Mosston (1972) depicts teacher decisions as pre-impact decisions, impact decisions and post-impact decisions. Similarly, Whitfield's (1974) categories, reflecting Jackson's, were labelled pre-lesson and within lesson choices, where the distinction of place and time of choice is related to the time available for decision. A somewhat different stance is adopted by Marland (1977) who differentiates between preactive plans and interactive decisions.

Characteristics of teachers' decisions.

Preactive and Interactive Decisions: Teachers' preactive thought processes were considered earlier from the perspective of the teacher as a planner. In that context it was noted that Shavelson (1976) claims that decisions taken during instructional planning maybe the most important ones teachers make. In this regard Jackson (1968) and Shavelson (1976) point out that teaching as decision making is a more appropriate model for those situations in which there is sufficient time for teachers to decide deliberately what to do.

The significance placed by Shavelson on pre-instructional decisions is not supported by Farr and Brown (1971) who claim that it is within the classroom that the most important decisions are made; although arguing that most instructional decisions are made by forfeit, where a teacher fails to recognize that a decision could be made or by not being aware of possible alternatives. The usual forfeit decisions involve the continuation of a practice whether or not it is the most appropriate procedure for the situation.

In assessing the significance of both preactive and interactive decisions, Shavelson (1976) asserts that decisions taken during interactive teaching may be planned or extemporanious, but that most are modifications of decisions made in planning. Whitfield (1974) differentiated between pre-lesson decisions and within-lesson decisions, claiming that the latter are much less subject to external pressures, being more uniquely the teacher's own responsibility and more open to his direct control.

Integrative Decision Making: Borko et al. (1978:24) present a view of teaching as "a process of integrating all our knowledge and skills into a decision that best suits the situation at any given moment." In addition, in order for a teacher to choose from his repertoire Shavelson (1978) asserts he must integrate a large amount of information about students. This concept of integrative decision making is supported by Bowles (1973) who claims that the effective teacher must not only refine the decision making skill so that synthesis occurs instantly, but must consciously remain open so that adequate data are ingested prior to systhesis. From their study Smith and Geoffrey (1968:92) concluded:

> The decision making model has tremendous possibilities in linking conceptually such diverse influences on the classroom as the formal curriculum guides, the faculty peer-group beliefs and norms and the composition of the class itself . . . .

Teacher decisions are conceptualized by Morine (1975b) as the links that unite classroom events. She claims that when teacher decisions integrate events they form a coherent chain of instruction. This view point is upheld by Clark and Joyce (1975) who cast the teacher as the human link binding the aspects of teaching together.

Skilled and Unskilled Decisions: In 1964 Dill claimed that evidence suggested that the basic elements in the thought processes of skilled and less skilled decision makers were not necessarily dissimilar. In a similar vein, Shavelson (1973) hypothesizes that what distinguishes the exceptional teacher is not the ability to ask a high-order question, but the ability to decide when to ask such a question. Ashcroft (1978) applies the same argument with respect to planning skills.

Alternatives Considered: Due to the rapidity and immediacy of interactive classroom events, Whitfield (1974) and Shavelson (1976) claim that fewer than an optimal number of alternative strategies are considered by the teacher in decision making. From his research into teachers' interactive thoughts, Marland (1977) reports that teachers made fewer than ten interactive decisions per lesson, and usually considered only two alternatives when making a decision. In reviewing this situation he draws parallels with the findings of Sprafka and Elstein (1974) regarding the propensity of physicians to generate and consider alternatives.

While Whitfield (1974) suggests that the failure by teachers to generate all options may reflect insensitivity, inflexibility or lack of creativity in the classroom, he also raises an alternative view point, conjecturing that as a result of experience, teachers have a well-developed value system which enables them to filter out options which lack viability.

The teacher and rational decision making. Yinger (1978) suggests that the view of the teacher as problem solver and decision maker implies greater rationality than exists in reality, for the rapidity and immediacy of the classroom interaction often preclude the rational-purposeful kind of thinking associated with problem solving and decision making. MacKay and Marland (1978) concur, claiming that it is reasonable to suggest that the human's limited capacity for rational thought, together with the constraints imposed by the teacher's task environment, limit the usefulness of a rational model for describing teaching. When full cognizance is taken of the rapidity of classroom events and the massive number of interactions involved, Jackson (1968) questions the appropriateness of using conventional models of rationality.

Organizational and individual factors which impose limits on rationality were identified by Dill (1964) who supported Simon's view that men approach decisions with the goal of "satisficing" rather than "optimizing". This standpoint is corroborated with regard to the behavior of teachers by research conducted by Clark and Peterson (1976) and Marland (1977). On this issue Whitfield (1974:86) observes that ". . . effective teachers must clearly have developed mechanisms for arriving quickly at appropriate or 'temporal best' decisions."

Bowles' (1973) comparative analysis of teacher decision making with other decision making models provides a pertinent context for the suggestion that one reason teachers do not seek to optimize interactive decision making is due to the relative ease with which interactive decisions can be remade. Shavelson (1976) too, claims that interactive decisions can be readily readjusted.

With regard to this issue of rationality Jackson (1968:149) states:

> If teachers sought a more thorough understanding of their world, insisted on greater rationality in their action, were completely open minded in their consideration of pedagogical choices and profound in their view of the human condition, they might well receive greater applause from intellectuals, but it is doubtful whether they would perform with greater efficiency in the classroom . . . .

As a means of reviewing the literature related to the cognitive processes of teachers four metaphors have been presented, namely, the teacher as an information processor, a problem solver, a planner and a decision maker. Each of these presents a perspective of the information processing characteristics of the teacher in the preactive and interactive phases of teaching.

It is on a model of the teacher as an information processor that this study is posited.

Stimulated Recall

Research into covert mental activities has commonly relied upon introspective reports as a means of tracing the thought processes used by subjects as they solve problems, make decisions or process information. Bloom (1953, 1954) pioneered research in this area using stimulated recall which is a technique designed to facilitate retrospective verbalization of thought processes which occurred simultaneously with some recorded overt behavior. Bloom (1953:161) describes the basic idea of stimulated recall as one in which ". . . a subject may be enabled to relive an original situation with vividness and accuracy if he is presented with a large number of cues which occurred during the original situation." Under these circumstances the individual is a participant in an event at one time and is a subject reporting his conscious thought participation after the event (Bloom, 1954).

Visual stimuli were considered by Bloom (1953) as a means of representing the original event but were ruled out on the grounds that each individual has a unique view of the situation and that these could not all be captured on film. He argued, "the cues which would seem to be most attended to and which are almost equally available to all in the classroom are the auditory cues" (1953:161). Bloom's experimentation used sound recordings. Some ten years later Kagan, Krathwohl and Miller (1963), researching counselor-education, introduced videotape replays in Interpersonal Process Recall (IPR) as a means of maximizing cues.

Stimulated recall typically involves a subject whose thought processes are to be disclosed and an interviewer whose role is to facilitate the disclosure. A videotaped or audiotaped recording of an event is replayed and the subject is assisted in recalling the covert mental activity which accompanied the overt behavior. The technique of stimulated recall is predicated on the assumption that subjects are able and willing to recall and articulate their thought processes, and to do so as accurately and completely as possible.

Gaier (1954) suggested that all of an individual's thoughts and feelings would not be revealed through introspective techniques, claiming that the subject would censor what he is willing to verbalize. Bloom (1953:162) in acknowledging this distinguished between an individual's recall and his report, noting "the extent to which a student will report the most private of his thoughts is largely a function of the rapport which is established in the interview situation." The characteristics of this rapport are identified by Fuller and Manning (1973) as comprising communicated authenticity, positive regard for the other person and empathy.

Kagan et al. (1963:239) in offering a rationale for stimulated recall observed, "apparently the subject feels removed enough from the image of himself on the television screen so that he is able to think of the 'person' on the screen as being well known to him, yet not quite he." Fuller and Manning (1973) argue however, that the viewing of a videotape of one's self involves intense focusing on the self which is emotionally arousing. Stress and anxiety may result, and in some circumstances the playback may be thought of as a threatening message which may inhibit the subject. Dawson, Dawson and Forness (1975) claim that self viewing informs the teacher of how much he differs from his self expectations.

From research findings Fuller and Manning (1973) report that self viewers initially focused on "physique cues", and Bedics and Webb (1971) report similar reaction from student teachers viewing videotaped replays of their classroom behavior. On first viewing attention focused on themselves, but by the third lesson concern centered on the teaching act.

These findings hold implication for stimulated recall and the basis for the rapport which must be established between subject and interviewer. The subject must be assured of anonymity and guaranteed that no administrative use will be made of the videotapes or of the recall data. Opportunity should be afforded the subject to view himself on videotape so that the focus of interest in the stimulated recall sessions lies in the teaching behavior rather than personal physical characteristics. A further measure to enhance the probability of accurate and complete recall is identified by Marland (1977) who reports recommendations from Shulman that the subject be fully informed of the goals of the research project and of the purposes to be served by the stimulated recall technique.

> . . . if not told, [subjects] may construct their own theory about the interviewer's intentions and could respond accordingly in ways which may distort the data, and subvert, unintentionally, the investigator's purposes (Marland, 1977:40).

The ability to recall covert cognitive behavior was inferred by Bloom (1953) from subjects' ability to recall overt activities with 95 percent accuracy within a time period of up to 48 hours. "The inference that the recall of one's own private conscious thought approximates the recall of the overt, observable events has led to the anticipation that the accuracy of the recall of conscious thought is high enough for most studies . . . ." (Bloom, 1953:162).

This issue of determining the extent to which an individual's report of his private thoughts are actually those experienced in the original situation was addressed by Gaier (1954) who claimed that in the absence of a direct technique for establishing the validity of these reported thoughts, it was necessary to establish it by means of inference. This argument, similar to that of Bloom (1953), assumed a high correlation between the accuracy of the individual's recall of the overt checkable activity and the accuracy of the recall of conscious experience. Accuracy of recall of overt events was traced over a sixteen day period with 94 percent accuracy reported after two days, declining to 65 percent accuracy after sixteen days. A second measure was the degree of confidence with which the subject reported his experiences. This was quantified as the number of "no recall" responses. In the first two days such responses were reported as being low.

The issue of whether the thoughts reported in a stimulated recall session are those actually experienced in the original situation rather than those aroused by the interview was also investigated by Gaier. He claimed that if an idea had undergone change during classroom discussion the reported experiences would be appropriate to the final stage of the idea discussed rather than the stage in the evolution of the idea identified in the stimulated recall. Research findings did not support this, but rather that subjects reported thoughts appropriate to the specific step focused upon.

Sprafka and Elstein (1974) note that introspection about covert mental processes is a research technique with a long and controversial history in psychology which stems in part from the view of the psychologists who rejected the investigation of conscious mental experience as a legitimate concern for psychology. Another reason for opposition was the disapproval of introspection as a method suitable for the behavioral sciences, because of the potential for error in introspective reporting and because of the difficulty in confirming the veracity of the recall data. Of this situation Shulman (1970:386) argues ". . . that the evil reputation which introspection has received is more a function of its misuse . . . than it is a function of some intrinsic insufficiency of the approach itself."

Stimulated recall procedures have been used in studies of the processes of medical enquiry (Sprafka and Elstein, 1974; Shulman and Elstein, 1975; Elstein, Shulman and Sprafka, 1978; Elstein, Sprafka and Shulman, 1978), in studies in education (Bloom, 1953; 1954; Krauskopf, 1963; Siegal, Siegal, Capretta, Jones and Berkowitz, 1963; Clark and Joyce, 1975; Marx and Peterson, 1975; Morine, 1975b; Clark and Peterson, 1976; Marland, 1977; Conners, 1978; Nolan, 1978; Cooper, 1979; King, 1979) and in the study of counselor-education in the field of mental health (Kagan, Krathwohl and Miller, 1963; Kagan and Schauble, 1969; Kagan, 1972; 1973). Stimulated recall has not been used widely in naturalistic settings. Marland (1977), Conners (1978), Nolan (1978), Cooper (1979) and King (1979) report use of the technique in the classroom.

Other means of introspective research have been employed such as the "think aloud" technique where the subject verbalizes his thoughts as he performs a task (teacher in-basket research, Shulman, 1965; medical enquiry, Sprafka and Elstein, 1974) and immediate recall where an event is stopped and the subject is asked to recall his thoughts immediately prior to the interruption (Hudgins, 1967).

Shulman (1974), Sprafka and Elstein (1974), Shulman and Elstein (1975) and Elstein, Shulman and Sprafka (1978) report the medical research conducted by Elstein and co-workers into the cognitive processes of physicians as they arrived at diagnoses. This study was carried out in a simulated office to avoid uncontrollable "noise" and data were collected by means of direct observation of the physician's actions in reaching the diagnosis, immediate introspections ("thinking aloud" technique), and stimulated recall. This complex tri-level protocol permitted cross referencing on recall items.

To this point stimulated recall has not achieved wide research exposure, but with regard to its application to teacher thought processes Marland (1977:238) claims:

> Introspective techniques, involving stimulated recall from videotape records of teaching behavior offer a viable means of studying the covert mental activities of teachers . . . .

Those who have used stimulated recall procedures have reported positively on its value, commenting that it has proved promising and that it has yielded rich, interesting data.

Summary

This review of the literature has focused on three main issues. Firstly, recent trends in educational research were traced and the emergence of the research interest in the cognitive functioning of teachers was identified. With the increased acceptance of the use of introspective methodology as a legitimate research tool, preactive and interactive teacher thought processes have become the topic of sustained and systematic inquiry.

Secondly, research in which the teacher is conceptualized and analyzed as an information processor, problem solver, planner and decision maker was reviewed from the perspective of the process-tracing tradition which has been largely atheoretical. The aim of this approach has been the observation of the various facets of teacher thought rather than the development of theory. Policy capturing research, based on the "black box" paradigm, in which the principal task is to analyze the input-output relationships with the goal of finding, as a substitute for the intervening cognitive processes, a mathematical formula which will predict human judgment, decision or diagnosis, has not been addressed in this review.

Introspective methodology has been employed in research designed to trace thought patterns with the objective of developing descriptive, isomorphic models of human thought processes. As its third element this literature review has examined research pertinent to teaching in which introspective methodologies have been used. The role of stimulated recall in this tradition has been emphasized.

While research into the cognitive processes of teachers is in its infancy it does represent an area of inquiry which is a potentially rich source of information regarding variables which hold possibilities for the enhancement of classroom practices.

CHAPTER III

DESIGN AND PROCEDURES

This chapter describes the research design, the selection of the subjects, the specific problems to be investigated, the assumptions underlying the research, the limitations of the study, the data collected and the major phases of the study which include the research procedures which were followed.

Design

This research project was a small-scale exploratory, descriptive study conducted in a naturalistic setting. Such a design is located in the emerging research tradition in education typified by Cronbach's (Magoon, 1977:654) proposal that;

> . . . researchers [should] simply but radically reverse the priority they have traditionally placed on building generalizations about effects of variables and give careful attention to particular cases first.

Harré and Secord (1972) support explanation of social behavior through intensive study of individual cases.

This study was exploratory in that it attempted to "discover significant variables in the field situation, to discover relations among variables, and to lay the ground work for later and more systematic and rigorous testing of hypotheses" (Kerlinger, 1973:406). The study conforms to the first phase of Rosenshine and Furst's (1973) descriptive - correlational - experimental loop for research in teaching.

Marland (1977) argues that the naturalistic setting ensures, as far as possible, that variables and relationships investigated in subsequent laboratory or field experiments adequately reflect naturally occurring phenomena.

This study traced the interactive thought processes of two teachers across ten lessons within a thirteen week time-frame. During this period both teachers attended an in-service program which they did not associate with the design of the study. The purpose of the research was to study the impact of this intervention program on teacher thought processes.

Four stimulated recall interviews were conducted with each teacher before the in-service experience to establish base-line data, four were conducted subsequent to the in-service experience in order to identify change and a further two were conducted after one month to provide a measure of the stability of any change.

Data on overt teacher behavior was coded for fourteen lessons with each teacher, ten lessons of which were the subject of stimulated recall interviews. Data from the other four lessons provided information on the teachers' overt classroom behavior when the researcher and videotaping equipment were not present in the classroom.

Background to the Study

This exploratory, descriptive study is set in the context of a larger quasi-experimental research project conducted jointly by the Centre for Research in Teaching at the University of Alberta and the Edmonton Public School Board, to investigate the effects on teacher behavior of training in specific teaching skills.

An experimental group of 67 grade three and grade six teachers, drawn from 30 schools under the jurisdiction of the Edmonton Public School Board was exposed to an in-service program comprising teaching skills and/or behaviors identified from recent research (and considered in the light of contextual features of the Edmonton school district) as being effective in achieving certain process or product goals of classroom instruction. These skills and behaviors are detailed in Appendix A.

The in-service program was offered in two modes. In the first, involving two half-day sessions one week apart, all of the teachers were exposed to the teaching skills and behaviors. These skills and behaviors were supported by both oral and written descriptions together with specific examples (Appendix B). Comprehensive discussion centered on the skills and behaviors.

Of the 30 schools involved in the project, 16 were randomly assigned to the second mode and the teachers of these schools were engaged in an additional two half-days of workshops, one week apart, at which a variety of media and learning experiences were employed to amplify and reinforce the teaching skills and behaviors.

Using a specially developed multi-faceted observation schedule, trained coders recorded classroom activities in at least five mathematics and language arts lessons both before and after the in-service program.

The effect of the in-service program on pupil learning was assessed using Edmonton Public School Board achievement test data.

The Subjects

Several of the schools involved in the larger project were approached in an attempt to identify teachers prepared to participate in this study. The teachers were informed that the study was designed to investigate teacher thought processes with the purpose of providing corroborative evidence for previously conducted studies. The shift in focus in research on teaching was outlined and the emergence of cognitive studies detailed. A grade three and a grade six teacher from one elementary school involved in Mode Two of the project agreed to participate.

The school in which the two teachers were employed catered for pupils from kindergarten through grade six and had a student population of 466. The grade three, comprising 30 pupils, was a heterogeneously grouped class accommodated in a self contained teaching area. The grade six, also heterogeneously grouped, had an enrolment of 27 pupils and was accommodated in an open-area teaching space incorporated in the Resource Centre.

Specific Problems

The specific problems investigated in this study related to the following major areas:

1. To what extent and in what manner do the interactive thought processes of teachers change as a result of a planned intervention program?

   What reference do teachers make to preactive decisions regarding lesson objectives, content, strategies and evaluation during the interactive phase?

   What kinds of information do teachers process during the interactive phase?
   What rules guide interactive classroom behavior?
   What factors influence teacher behavior during the interactive phases of teaching?

2. To what extent and in what manner do teachers' overt classroom behaviors change as a result of a planned intervention program?
   Do details of pre-instructional plans indicate the adoption of a different repertoire of management and instructional strategies?
   Do records of classroom behavior reflect a change in teacher behavior?

3. To what extent are changes in the interactive thought processes of teachers translated into changes in a teacher's overt classroom behavior?
   Does overt classroom behavior change without teachers reporting differences in thought processes?
   Do teachers resort to established teaching/classroom routines in the interactive phases despite changes in interactive thought processes?

4. To what extent and in what manner do the preactive thoughts of teachers change as a result of a planned intervention program?
   What are the planning phases observed by teachers in the preparation of lessons?

What changes, particularly in management strategies and instructional techniques, occur in preactive planning over the duration of the study?

5. Is there evidence that teacher behavior or teacher thought patterns change as a result of stimulated recall?

   Does learning occur through interaction with the interviewer?

   Is there evidence of systematic change in behavior as a result of stimulated recall?

Assumptions

This study of the cognitive processes of teachers was based on the following assumptions:

1. A teacher's interactive thought processes are significant determinants of teacher behavior in the classroom.
2. Introspective reports are appropriate and valid means of determining what people think, how they solve problems and how they process information.
3. Included in the information processed by teachers is a wide variety of information related to the instructional process.
4. The sample of interactive thoughts recalled under conditions of stimulated recall are representative of the teacher's covert thought processes throughout the lesson.
5. Teachers are able to recall and report the substance of their interactive thought processes.
6. By observing familiarization procedures, the recording of classroom behavior does not interfere with normal practices

to produce atypical behavior.

Limitations

The major limitations of this study are:

1. Although the total number of teacher thoughts that were sampled was large, the number of teachers and lessons was small.
2. The teachers involved represented a self selected sample - no random sampling techniques were used in the study.
3. Classroom observations were of a relatively short time period.
4. The task environment, considered a significant factor in influencing teacher cognitive behavior, was not standardized.
5. While essentially a naturalistic study in character, certain observer obtrusive effects may distort the behaviors observed.
6. This study focused on teacher thought processes before and after the in-service experience. The research design does not represent a controlled experimental situation and the in-service program constituted one known event within the teacher's environment during the duration of the study.

These limitations preclude the making of generalizations beyond the teachers involved in the study.

Data and Data Sources

Data Sources

The following data were obtained in order to address the research questions:

Pre-instructional interviews. Prior to the videotaping of each stimulus lesson a pre-instructional interview was conducted in order to obtain an overview of the major phases of the lesson and to provide a context within which to identify stimulus points for the stimulated recall session. The latter enabled the interviewer to probe for interactive thoughts related to the lesson plans, and to identify when decisions were taken to alter preactive planning.

In addition to the details of the preactive plans of the teacher this interview served to reveal the planning phases followed in the development of the lesson plan. These interviews were audiotaped and later transcribed. The pre-instructional interview schedule is outlined in Appendix C and the technical procedures and strategies followed are detailed in Appendix F.

Videotapes of lessons. With each teacher two 50 to 60 minute lessons in mathematics and two in language arts were videotaped before and after the in-service experience. In order to gain a measure of the stability of any change in the overt or covert behavior of the teachers, two further lessons were videotaped and coded one month after those which were recorded immediately following the in-service program.

The videotaped lessons were used to stimulate recall by the teachers of their interactive thought processes during the lessons. The procedures followed in videotaping lessons are described in Appendix F.

Stimulated recall interviews. Stimulated recall interviews were conducted as soon as possible after the filming of the stimulus lessons, and in each case were held on the day of the lesson. The timing of the interviews was arranged to suit the teacher's convenience, which in most cases was during the midday break. The interviews ranged in duration from 30 minutes (where the teacher was unexpectedly called away on a Friday and it was not possible to continue the interview within the 48 hour period recommended by Bloom (1953)) to 60 minutes, and were audiotaped. Typewritten transcripts were prepared. The procedure followed in conducting stimulated recall interviews is detailed in Appendix E and technical procedures and strategies are described in Appendix F.

Observational data. To provide data as a basis for assessing whether classroom behavior changed over the duration of the study, an observation schedule (Appendix D) comprising the following, was coded by a trained coder for each of the videotaped lessons:

1. Sketch of the Classroom. On this the salient characteristics of the classroom milieu were noted, including the arrangement of desks and the location of special work or interest areas. Changes which occurred within the classroom during a lesson were recorded.
2. Classroom Activity Description. This represented a brief chronological descriptive record of the major facets of the lesson, indicating:
    - i. the activities that occurred during the lesson;
    - ii. who were involved in the activities and in what grouping patterns;

iii. where in the teaching space the activities occurred;

iv. the duration of each activity.

This is a modified version of an instrument used in the Crawford and Gage studies in California (Crawford and Stallings, 1978; Gage, 1978) as well as in Stallings' work (Stallings, 1977,1978; Stallings and Hentzell, 1978) in California.

3. Low Inference Data. Samples of classroom interactions were recorded using a contracted version of the Expanded Brophy-Good Teacher-Pupil Dyadic Observation System. This comprehensive low inference observation system was developed by Brophy and Good (1969) and refined by Brophy and Evertson (1973). The schedule developed for this study focused on teacher and child initiated interaction, and gathered data concerning overt behaviors.
4. High Inference Data. Five-point rating scales were used to record observer ratings on 31 high inference variables. These variables reflected the teaching strategies which comprised the substance of the in-service program.
5. Instructional Materials Inventory. All instructional materials used during the lesson were recorded on a prepared checklist.

To facilitate the coding of the observational data, each lesson was divided into ten-minute time capsules within which:

i. three minutes were devoted to the recording of the Low Inference Data on the Three Minute Observation Schedule;

ii. the Classroom Sketch was updated;

iii. the Classroom Activity Description was maintained;

iv. The Instructional Materials Inventory was completed.

High inference measures require a high degree of deduction on the part of the rater "who must take into account everything he has observed about the teachers involved and arrive at a judgment in some complex and idiosyncratic way" (Good, Biddle and Brophy, 1975:38). For this reason the high inference ratings were completed at the end of each lesson as a summation of the observer's impressions.

Teacher presage data. To assist in the interpretation of the information gained from stimulated recall and coder observation, the following presage data were collected for each teacher; nature and length of teacher education program, teaching experience, and experience with the current grade.

Phases in the Study

Two major phases were involved in this study. The first or preparatory phase involved the development of the instrument and the training of the coders in its use, laboratory training in the use of audiovisual equipment and stimulated recall methodology, and a pilot study. In the second phase the research was conducted and the data collected.

Preparatory Phase

Development of observation schedule. A research team comprising the Director of the Centre for Research in Teaching, the researcher and three other graduate students developed a multi-faceted observation schedule designed to record overt teacher process data related to the teaching strategies which had been identified from recent research as being effective in achieving certain process or product goals of classroom instruction.

The components of this schedule were:

1. Sketch of the Classroom;
2. Classroom Activity Description;
3. Three Minute Observation Schedule (a contracted version of the Expanded Brophy-Good Teacher-Pupil Dyadic Observation System);
4. High Inference Data Schedule;
5. Instructional Materials Inventory.

This composite instrument was designed to facilitate the recording of behavior related to management and classroom discipline, instructional methods and classroom interaction. The observation schedule is described in Appendix D.

Training of coders. To collect data on classroom behaviors for the larger quasi-experimental research project, a team of coders selected for their experience in classrooms was trained in the use of the observation schedule. The ten week training program, involving twelve two-hour training sessions, comprised an overview of the nature of the project, discussion and definition of the teaching strategies central to the project, familiarization with all aspects of the observation instrument and practice in its use. Training with the schedule utilized simulated classroom interaction which permitted control over the pace and complexity of the interaction to be coded; videotaped lessons which facilitated replay, discussion and elucidation;

and in-class experience. In the latter, coders worked in pairs to enable discussion of issues, resolution of difficulties and clarification of problems. On the basis of the collective in-class experience of the seventeen coders minor structural alterations were effected to the schedule to achieve greater clarity and ease of use.

One of this team of coders recorded the overt teacher process data in the lessons videotaped for stimulated recall in this study. Observational data were also coded for additional lessons as part of the larger study.

Laboratory training. In order to gain facility with the audiovisual equipment, laboratory training was undertaken and the technical experience so gained was integrated with the recommendations contained in Marland (1977) and Conners (1978) relative to videotaping of lessons for stimulated recall. With the assistance of King (1979) experience was gained in familiarization strategies, filming and sound recording techniques, and stimulated recall procedures. Protocols generated by other researchers employing stimulated recall methodology were studied in order to gain greater competence with, and sensitivity to the technique.

Pilot study. A two week pilot study was conducted with the specific objectives of developing:

1. familiarization strategies in establishing rapport with a classroom teacher and pupils;
2. competence with the audiovisual equipment in the classroom setting;

3. interviewing procedures for,
    i. the pre-instructional interview,
    ii. stimulated recall sessions.

A grade six teacher with a class of 26 pupils accomodated in an open-area teaching space participated in the pilot study. Two mathematics and two language arts lessons were videotaped for the purpose of stimulated recall and the audiotapes of these interviews were reviewed by the researcher as a means of refining the interviewer role and by a faculty member of the University of Alberta.

The pilot study proved a valuable learning experience and met the objectives of the researcher.

Data Collection Phase

Identification of subjects. Cannell and Kahn's (1968:537) claim that "research evidence on the interviewing process . . . strongly urges that respondent motivation be conceptualized in terms that take account of the social situation of the interviewer and respondent, of the nature of the transaction between them, of their mutual perceptions of each other and their joint task . . . .", guided the researcher in his initial contact with the two teachers who had expressed willingness to consider participation in the study.

An open approach was adopted in describing:

1. the purpose of the study and where it was perceived to fit in the current research milieu. In order to avoid affecting subsequent behavior the study was described in broad terms and care was exercised in avoiding identification with the in-service program. The rationale given for the form and

timing of the study was to enable the researcher to use the observational data collected as part of the larger quasi-experimental study as a context in which to locate this study;

2. the research strategies involved in the study. The teachers were made aware that the study would involve the presence of a coder and the researcher in the classroom for ten lessons;
3. the time demands that would be made upon the teacher by stimulated recall methodology.

Anonymity was guaranteed and the teachers were assured that no administrative use would be made of the videotapes of the lessons or of the audiotapes of the stimulated recall interviews. This was particularly necessary because of the perceived link between this study and the larger quasi-experimental research project involving the Edmonton Public School Board.

In establishing that the objectives of the study focused on teacher thought processes, it was emphasized that the study was not designed to be evaluative either of the teacher's classroom strategies or of the reported thought processes.

Familiarization procedures. Familiarization was approached at two levels. Cognizant of Bloom's (1953) claim that the completeness with which a subject will report his thoughts is a function of the rapport which is established between the interviewer and subject, the researcher actively sought to establish a rapport based on communicated authenticity, positive regard for the other person and empathy (Fuller and Manning, 1973). Every opportunity was taken to engage in social interaction with the teachers so that the researcher would be perceived as an interested colleague.

In a bid to minimize the obtrusiveness of the researcher and the videotaping equipment in the classroom, and the potential impact of this on both teacher and student behavior, a period of familiarization in each classroom was undertaken. During this time the researcher:

1. was introduced to the class as an overseas teacher interested in studying the operation of classes in Canada;
2. familiarized himself with the classroom routine, teaching styles and management techniques of the teachers;
3. sought to gain acceptance of his presence within the classroom;
4. introduced the videotaping equipment into the classroom in order that the teacher and pupils would become accustomed to it. Several lessons were videotaped and opportunities provided for the teacher and classmembers to view themselves on television. In filming lessons for this purpose care was exercised to ensure that all students were included. For the teacher, the significance of this step lay in the reduction of the tendency reported (Bedics and Webb, 1971; Fuller and Manning, 1973) for people to concentrate initially on physical characteristics when first viewing themselves on film. This step was incorporated to enhance the likelihood that in the stimulated recall sessions the teacher would focus on teaching behavior and not on physique cues.

The presence of videotaping equipment in the classroom did not evoke undue interest as the school possessed similar equipment with which the pupils were familiar;

5. arranged a schedule for videotaping the mathematics and language arts lessons which were to be coded as part of the larger research project.

Collection of Data

Overt Teacher Process Data: The observation schedule developed for the quasi-experimental research project was used in this study to describe the overt classroom behavior of the two teachers. To provide base-line data three language arts and three mathematics lessons each of one hour's duration were coded for each teacher before the in-service experience. Of these, two lessons in both subject areas were videotaped for use in stimulated recall. A further six lessons were coded for each teacher immediately after the in-service program, of which four were videotaped, and two more were coded and videotaped one month later.

Covert Teacher Process Data: With each lesson identified for stimulated recall the following routine was observed by the researcher:

1. Before the commencement of the school day the pre-instructional interview was conducted. The interview strategy adopted is described fully in Appendix C.
2. The lesson was videotaped and potential stimulus points identified. The technical procedures and strategies followed in videotaping lessons are detailed in Appendix F.
3. The stimulated recall interview was conducted during which:
    i. the objectives of the study were reiterated;
    ii. stimulated recall methodology was outlined and the subject asked to relive the lesson, recalling thoughts, feelings, responses and reactions experienced during

the lesson. The subject was asked to identify decision points and to report the alternatives considered.

iii. the subject was invited to identify stimulus points and to stop the videotape as he chose. This approach was adopted in view of Kagan's statement (reported in Marland, (1977:284) that ". . . what little is gained by having the inquirer stop the tape is lost in that the inquiree loses some sense of control in being the ultimate interpreter of his/her own experience." While the researcher wanted to pose focused questions related to the teaching behaviors which comprised the substance of the in-service program, care was taken to avoid sensitizing the teachers to these behaviors prior to the in-service experience and to providing post-experience reinforcement. For these reasons the subject was invited to exercise control over the selection of stimulus points while being informed that the researcher had identified stimulus points considered of relevance to the study.

The role of interviewer adopted by the researcher was to assist the teacher recall and verbalize as completely and accurately as possible the thoughts, feelings, reactions and decisions which occurred during the interactive phase of teaching. The interview procedure followed is detailed in Appendix E.

Teacher Presage Data: During the first pre-instructional interview, details relating to the nature and length of the teacher education program the teacher had undergone, years of teaching experience and experience with the current grade level were collected.

Intercoder reliability. For the data obtained from the observation schedules, intercoder reliability was established.

For the low inference data coded on the Three Minute Observation Schedules, reliability was calculated using the formula proposed by Brophy and Evertson (1973). The formula is:

Percentage agreement = number of coding decisions made by both coders and agreed upon, divided by itself plus the number of codings made by the first coder but not the second, plus number of codings made by the second coder but not the first.

Intercoder reliability was calculated at 80.3 percent, a result which compares favorably with Brophy and Evertson's (1973) report that it is possible to train coders to reach an 80 percent agreement criterion. They claim, however, that this level is often difficult to achieve due to flurries of interactive activity in the classroom.

Inter-rater reliability for the high inference rating scales was calculated according to the following formula:

$$\text{Percentage agreement} = \left[\left(\frac{T_A}{T_A + T_D} \right) \times 100 \right] \text{percent}$$

where T_A and T_D are the total numbers of agreements and disagreements respectively. The high inference variables were rated on five-point scales, and for the purpose of calculating inter-rater reliability ratings of 1 and 2 and ratings of 4 and 5 were coded as "agreements".

Inter-rater reliability was calculated as 61.3 percent. This figure may reflect the fact that the check-coder, while competent with the rating scale, did not possess the same degree of familiarity with either the classroom context or the idiosyncracies of the classroom teacher. A subsequent inter-rater reliability was calculated using the researcher as check-coder. In this case where the coder and the researcher had almost identical exposure to the classroom and to the teacher the inter-rater reliability was 74 percent. With ratings of 1 and 2 and ratings of 4 and 5 coded as "agreements", this formula would produce a conservative estimate of reliability in that the agreement-disagreement dichotomy does not take full account of the magnitude of differences between two ratings.

CHAPTER IV

DATA ANALYSIS PROCEDURES

In this study three major types of data were collected:

1. teacher process data which was gathered by means of the observation schedule as part of the larger quasi-experimental study;
2. details of the preactive planning of teachers which was obtained by means of the pre-instructional interview. This addressed the phases considered by the teacher in the development of the lesson and the sequencing of these phases;
3. teacher interactive thought processes gained through the introspective technique of stimulated recall.

This chapter will outline the analytical techniques which were applied to the data. To reflect the focus of the study, emphasis will be placed on detailing the features of the system developed for analyzing the content of the stimulated recall interviews.

Analysis of Teacher Process Data

Analysis of the teacher process data was directed at description of overt classroom behavior within the context of the quasi-experimental study. The data pertinent to each of the subjects were considered in order to provide a description of the observed behavior together with an analysis of change.

Analysis of the Pre-instructional Interviews

Two purposes were served by the pre-instructional interviews. The first was to obtain an overview of the major phases of the lesson in order to provide a context within which to identify stimulus points for the stimulated recall sessions. This information enabled the researcher to probe for interactive thoughts related to the lesson plans, and to identify when decisions were taken to alter preactive planning. Secondly, the planning phases followed in the development of the lessons were addressed together with the sequence in which they were considered. The transcripts of the pre-instructional interviews conducted with each teacher were analyzed for the purpose of identifying and describing details of lesson planning. Evidence of change over the duration of the study was sought.

Planning details were categorized on the following basis:

1. objectives, goals or purposes of the lesson;
2. content to be covered in the lesson;
3. learning activities in which the pupils were to be engaged;
4. materials and other resources to be used during the lesson;
5. diagnosis of pupil achievement in previous lessons;
6. evaluation of the pupil achievement in terms of the stated objectives;
7. organizational issues such as grouping, use of time, use of space, location, access to resources;
8. teaching strategies, such as motivation or introduction, demonstration, questioning, teaching method.

Analysis of Stimulated Recall Protocols

Content Analysis of Interactive Thoughts

To analyze the transcripts of the stimulated recall interviews content analysis was used, a technique which Holsti (1968:597) defined as a ". . . multipurpose research method developed specifically for investigating a broad spectrum of problems in which the content of communication serves as the basis of inference." He further described it as ". . . any technique for making inference by objectively and systematically identifying specified characteristics of messages" (Holsti, 1969:14).

Marland (1977) claimed that analysis of the verbal protocols of teachers in stimulated recall interviews fits comfortably within the broad spectrum of problems defined by Holsti (1968) as those in which the application of the content analysis mode of research is appropriate.

While definitions of content analysis have tended to change over time with refinement of the technique and with its application to new areas and different materials, Holsti (1969:3) identified three generally agreed upon characteristics of content analysis; objectivity, system and generality.

1. Objectivity stipulates that each step must be carried out according to explicitly formulated rules and procedures to minimize the possibility that the findings reflect the analyst's subjective predisposition rather than the content of the material under analysis.
2. Content analysis must be systematic, which means that content or categories are included or excluded according to

consistently applied criteria.

3. Generality requires that the findings have theoretical relevance.

Content analysis involves coding, which Holsti (1969:94) described as:

> . . . the process whereby raw data are systematically transformed and aggregated into units which permit precise description of relevant content characteristics. The rules by which this transformation is accomplished serve as the operational link between the investigator's data and his theory and hypotheses. Coding rules are thus a central part of the research design . . . .

It is through the process of coding that qualitative data are transformed into a form which renders them susceptible to qualitative treatment.

Guetzkow (1950) identified two operations involved in the coding process:

1. separation of the qualitative material into units;
2. establishing category-sets into which the unitized material may be classified.

He claimed that the fruitfulness of the transformation would depend upon the ingenuity and insight with which the units and category-sets were selected. In this regard the significance of the contextual setting of the data is argued by both Bloom (1954) and Taba et al. (1964).

The selection of a category-set and the choice of the size of unit are related decisions Guetzkow (1950:47) asserted, stating:

> The development of a set of categories into which the qualitative material may be classified is always accompanied explicitly or implicitly by a decision as to the size of the unit into which the material shall be divided before it is categorized. Yet, selection of unit size seems more dependent upon the category-set employed than choice of category set upon unit size.

Unitization. The unit of analysis used by Bloom (1954:27) was the thought or ideational unit which he defined as ". . . that proportion of the report which is centered on a single idea, activity or thought." Taba et al.'s (1964:115) definition of a thought unit was adopted and modified by Conners (1978:352) to state, "a remark or series of remarks which expresses a more or less complete idea and serves a specified function." A thought unit may comprise a single word, a part of a sentence, a sentence or an entire paragraph.

Marland (1977:304) claimed that the categories largely establish the unit:

> . . . the distinction between the two stages of segmentation and categorization is blurred because the unit selection is best understood in terms of the categories.

This supported Guetzkow's (1950:50) assertion that the selection of the amount of material to be included in each unit depends upon the demands imposed by the category-set. King (1979:385) suggested that in coding data:

> . . . the procedure to be used involves one of examining the transcripts and determining each unit on the basis of a section of the data complying with one of the categories of interactive thought. The unit is only established when a segment of the transcript matches with the characteristics of a category.

Category-sets. The development of a category-set comprises, in Guetzkow's (1950:48) terms, the identification of a number of classes or "pigeon holes" into which the units of qualitative data may be placed. Definition of categories requires that they:

1. reflect the purpose of the research. The analyst must define the variables being dealt with (conceptual definitions) and specify the indicators which indicate whether a given content datum falls within the category (operational definition);

2. be exhaustive so that all relevant data can be classified;
3. be mutually exclusive so that no unit can be placed in more than one category;
4. be derived from a single classification principle which stipulates that conceptually different levels of analysis be kept separate (Holsti, 1969:95).

With respect of category size, Guetzkow (1950:49) noted, "when richness of data is lost by the "lumping" of many units into a single broad category, the simultaneous employment of subcategory-sets along with the exhaustive supraordinate category-set is advantageous." Subcategories were used to facilitate finer analysis of the substantive components of teacher thought as described in particular categories.

The category-set developed for this research was generated after:

1. review of related literature;
2. consideration of the major research questions addressed in the study;
3. examination of the stimulated recall data;
4. consideration of the characteristics of the teaching strategies which comprised the substance of the in-service experience.

With regard to the latter, in the stimulated recall situation the teaching strategies could not be explicitly focused upon or addressed directly by the researcher because such action could have served to:

1. sensitize the subject to those behaviors prior to the in-service program and so have compounded the impact of the intervention program,

ii. reinforce the strategies after the program, again compounding the impact of the in-service experience.

For this reason the teaching strategies of the in-service program are not directly reflected in the category-set that was developed.

For this study, which generated protocols containing a large amount of data difficult to summarize and analyze by methods commonly used with overt behavior, content analysis was considered an appropriate technique of analysis. The procedures followed in coding the data are summarized below. A comprehensive description of the content analysis system developed for this study is detailed in Appendix G. Broadly, the components of the system comprised the following:

1. guidelines for differentiating interactive from non-interactive thoughts reported in the stimulated recall protocols. This was necessary because of the research focus in this study on teacher interactive thought processes. Despite procedures adopted during the interview to have the teachers concentrate on interactive thoughts and to distinguish between thoughts which occurred during the lesson and those which occurred prior to or after instruction, both teachers frequently crossed between the interactive and non-interactive domains;
2. an ideational unit, which for this study was defined as a remark or a series of remarks which expresses a more or less complete idea and serves a specified function;
3. a category-set into which ideational units were classified.

These ten categories, described briefly, are:

Instructional Strategies - Methodology.

Teacher thoughts related to the conduct of the instructional aspect of the lesson.

Instructional Strategies - Classroom Management and Control.

Teacher thoughts pertaining to the organization, management and control of the learning environment.

Instructional Strategies - Lesson Content.

Teacher thoughts centering on lesson objectives, content and resources.

Perceptions.

Units in which the teacher reports sensory experiences in the learning environment.

Interpretations.

Thought units in which the teacher attributes meaning or explanation to a perception.

Pupil Information.

Teacher's thought units which are centered on pre-lesson information about the pupils.

Feelings.

Units in which the teacher reports emotions and reactions experienced during the lesson.

Self Awareness.

Teacher thoughts reporting consciousness of teacher behavior in the learning environment.

Beliefs.

Teacher thoughts concerning the characteristics of children and their behavior. Statements may include reference to general pedagogical beliefs, learning, discipline and classroom management.

Non-Task-Related Thoughts.

Teacher thoughts which are unrelated to the events of the lesson.

Reliability of Coding

Conners (1978:107) stated;

> . . . errors in distinguishing between interactive and non-interactive data, in unitizing and in classifying can have compounding effects that will affect the final reliability figure of the content analysis system.

To determine the reliability with which the content analysis system developed for this study was applied to the data in the study, intracoder reliability was calculated which reflected the stability with which the researcher coded data on two occasions ten weeks apart.

To provide a measure of the reliability of the content analysis system, intercoder reliability was calculated based upon coding by a graduate student uninvolved with the study who applied the content analysis system detailed in Appendix G to a sample of the data.

Differentiation of interactive from non-interactive thoughts. Determination of the consistency with which interactive thoughts were differentiated from non-interactive thoughts was based on a coefficient of reliability which reflects the ratio of coding agreements to the total number of coding decisions (Holsti, 1969:138)

$$C.R. = \frac{2M}{N_1 + N_2}$$

where M is the number of coding decisions on which the two coders are in agreement, and N_1 and N_2 refer to the number of coding decisions made by coders 1 and 2 respectively.

Unitization. The reliability with which the interactive thoughts contained in the protocols were identified as constituting thought or ideational units was established using a formula developed by Guetzkow (1950) who contended that the reliability of the unitizing process can be determined by expressing the difference between the coders as a percentage of the sum of the number of units obtained by each coder:

$$U = \frac{O_1 - O_2}{O_1 + O_2}$$

where O_1 represents the number of units obtained by the first coder and O_2 is the number obtained by the second coder. Perfect agreement is represented by a coefficient of zero (Guetzkow 1950:55).

Categorization. To calculate the reliability of categorization, Scott's coefficient was used. Holsti (1968) notes that this index of reliability corrects not only for the number of categories in the category-set but also for the probable frequency with which each is used. The Scott coefficient is:

$$\text{Reliability} = \frac{Po - Pe}{1.00 - Pe}$$

where Po represents the agreement between two observers and Pe represents the agreement between two observers that occurs simply by chance (Ober et al., 1971:80).

Intracoder and intercoder reliability coefficients were calculated for the three operational stages involved in coding, and are presented in Table 1.

Table 1

Content Analysis System
Intracoder and Intercoder Measures of Reliability

	Intracoder	Intercoder
Differentiation of interactive data	0.95	0.94
Unitization	0.01	0.02
Categorization	0.84	0.82

Holsti (1969:142) claims that "defining an acceptable level of reliability is one of the many problems in content analysis for which there is no single solution." He suggests that the degree of reliability sought must reflect both the degree of complexity of the content analysis system used and the significance of the research problem involved.

Marland (1977) and King (1979) established a reliability coefficient of 0.70 as an acceptable level of reliability. This is supported at the level of rule of thumb by Lai (1979) after a comprehensive review of the literature.

In view of the complexity of the content analysis system used and Holsti's (1969) assertion that Scott's coefficient produces a conservative estimate of reliability, a reliability coefficient of 0.70 was considered an acceptable level of reliability for this study.

Macro-Analysis of Stimulated Recall Data

Consistent with the findings of Marland (1977), Conners (1978) and Cooper (1979) the stimulated recall protocols generated in this study contained a significant element of non-interactive thought which was assessed as containing rich and valuable data, representing an additional and important dimension of teacher thought processes. It was felt that the total data contained in the stimulated recall protocols provided insight into the underlying educational philosophy upon which the interactive thoughts were based. To capitalize fully on the richness and complexity of this data, all data obtained by means of stimulated recall were subjected to a macro or global analysis for the purpose of identifying and describing elements of the educational philosophies of the two teachers.

Value was perceived to lie in the identification and description of such elements, together with the identification of change or evidence of stability within the underlying educational philosophy of the teachers over the duration of the study. If the origins, causes and bases of a teacher's interactive thoughts are located in his underlying educational philosophy, stability in the latter could be expected to be manifest in stability, over time, in interactive thoughts and overt behavior.

The analytical process adopted entailed the use of Guetzkow's (1950) "sieve" coding technique which is not an exhaustive coding system but rather one which permits consideration of sections of the recall data larger than the ideational unit, so avoiding the danger of over fragmentation of data which Conners (1978) highlights as a potential problem of the content analysis system adopted for the interactive data.

The objective of the macro-analysis was the identification of phenomena which comprise elements or characteristics of the teacher's educational philosophy and which exert a directing influence on teacher classroom behavior. This macro-analysis will serve to provide a fuller context for the interpretation of the micro-analysis proposed for the interactive data.

The protocols which had been transcribed from the audiotapes of the stimulated recall sessions comprised:

1. segments, which contained all of the dialogue, between the teacher and the researcher, related to one stimulus point on the videotape;
2. exchanges, which were unbroken sections of discourse by either participant in the interview.

Analysis of interactive thoughts was based on the ideational or thought unit outlined in the previous section. Macro-analysis was carried out by considering each protocol, exchange by exchange, recording the frequency with which reference was made to particular phenomenon. The analysis included both interactive and non interactive thoughts.

CHAPTER V

PRESENTATION OF DATA

This chapter presents the data collected to answer the research questions posed in Chapter I together with description of significant features identified in the data.

Teacher Presage Data

Two teachers involved in the larger quasi-experimental study agreed also to participate in this study. In order to provide a contextual framework within which to interpret data related to teacher thoughts, teacher classroom behavior and teacher planning, teacher presage data were collected. These data are presented in Table 2.

The two teachers differed significantly in terms of the nature and length of their initial teacher education programs, their teaching experience and their experience with the grade currently being taught.

One element observed in establishing rapport with the teachers was the guarantee of anonymity. In reporting the data, reference will be made to each teacher by the numeral of the grade taught such that the Grade Three teacher will be referred to as Teacher 3 and the Grade Six teacher as Teacher 6. Where it is significant, the lesson in which the data were collected will be indicated, so that T3.9 refers to Teacher 3, lesson nine.

Table 2

Teacher Presage Data

	Teacher 3	Teacher 6
Nature and Length of Teacher Education	One year pre-service training subsequently upgraded to B. Ed.	Five years pre-service training comprising B.PE. and Professionsl Diploma after Degree
Teaching Experience	17 years	5 years
Experience With Current Grade	15 Years	2 years
Class Size	30 pupils	27 pupils

Classroom Observation, Videotaping and Stimulated Recall

The timing and duration of classroom observation, videotaping of lessons and the conducting of stimulated recall sessions are summarized in Tables 3 and 4.

Teacher Process Data

Research Question 2 addresses the issue of whether the teachers' overt classroom behavior changed over the duration of the study. A second order issue is whether the change is consonant with the strategies which constituted the substance of the in-service program. The observation schedule developed for the larger study, and detailed in Appendix D, was used to code classroom behavior in language arts and mathematics lessons. Both low and high inference data were collected.

Low Inference Data

Classroom layout and grouping. Details of the classroom layout, the location and use of special interest areas, desk arrangements and the grouping of pupils are contained in Tables 5 and 6.

From Table 5 it is evident that little change occurred in the physical layout and use of the learning space in Grade 3, with the exception of the creation of a sixth row of desks coincident with the in-service course.

The use of two ability groups for language arts continued and the percentage of lesson time in which grouping was used remained constant. Throughout the study a whole class approach was adopted in mathematics.

Table 3

Distribution of Observed Lessons Showing Duration of Observation, Videotaping and Stimulated Recall. Teacher Three

	Lesson	Date	Time	Duration of Observation	Duration of Videotaping	Duration of Recall
Pre In-service	L. Arts	28 Feb.	10.30 - 11.35	65 min.	60 min.	45 min.
	Math.	1 March	8.45 - 9.45	60 min.	60 min.	70 min.
	L. Arts	2 March	10.30 - 11.30	60 min.	60 min.	60 min.
	Math.	5 March	8.50 - 9.45	55 min.	55 min.	60 min.
	L. Arts	6 March	10.35 - 11.30	55 min.	-	-
	Math.	7 March	8.50 - 9.50	60 min.	-	-
Post In-service (a)	Math.	10 April	8.45 - 9.45	60 min.	60 min.	50 min.
	L. Arts	17 April	10.30 - 11.30	60 min.	-	-
	Math.	18 April	8.50 - 9.45	55 min.	-	-
	L. Arts	19 April	10.30 - 11.30	45 min.	50 min.	50 min.
	Math.	20 April	8.45 - 9.45	60 min.	60 min.	55 min.
	L. Arts	23 April	10.30 - 11.30	60 min.	60 min.	55 min.
(b)	Math.	21 May	8.45 - 9.45	60 min.	60 min.	50 min.
	L. Arts	24 May	10.30 - 11.15	45 min.	45 min.	55 min.

Note: (a) Observations in April immediately following the in-service program.
(b) Observations in May, one month after (a).

Table 4

Distribution of Observed Lessons Showing Duration of Observation, Videotaping and Stimulated Recall. Teacher Six

	Lesson	Date	Time	Duration of Observation	Duration of Videotaping	Duration of Recall
Pre In-service	Math.	2 March	8.50 - 9.45	55 min.	-	-
	Math.	6 March	8.45 - 9.45	60 min.	60 min.	50 min.
	L. Arts	6 March	9.55 - 11.00	35 min.	-	-
	L. Arts	7 March	9.45 - 11.00	40 min.	50 min.	50 min.
	Math.	8 March	9.15 - 10.15	-	60 min.	50 min.
	Math.	9 March	8.50 - 9.45	55 min.	-	-
	L. Arts	9 March	10.30 - 11.30	60 min.	50 min.	30 min.
Post In-service (a)	Math.	11 April	8.45 - 9.50	65 min.	55 min.	45 min.
	L. Arts	17 April	9.45 - 11.00	30 min.	50 min.	50 min.
	L. Arts	18 April	9.45 - 11.05	75 min.	50 min.	50 min.
	Math.	24 April	8.45 - 9.45	60 min.	55 min.	35 min.
	Math.	25 April	8.45 - 9.45	60 min.	-	-
	L. Arts	25 April	10.30 - 11.25	55 min.	-	-
(b)	Math.	18 May	8.45 - 9.45	60 min.	60 min.	45 min.
	L. Arts	23 May	9.45 - 11.00	60 min.	60 min.	40 min.

Table 5

Information from Observation Schedule Relevant to
Class Population, Room Layout, and Grouping. Grade Three

	Subject	Lesson	CLASS POPULATION		DESK ARRANGEMENT			USE OF GROUPS				PERIOD OF OBSERVATION	A.V. EQUIPMENT
			Enrolled	Present	Rows	Groups	Random	Number	Location	Time Used	% of Lesson		
Pre In-service	L.Arts	1^v	30	27	5			2	desks floor	65 min.	100%	65 min.	
		2^v	30	27	5			2	desks	60 min.	100%	60 min.	
		3	30	27	5			2	desks	55 min.	100%	55 min.	
	Math	1^v	30	29	5			whole[1]	desks			60 min.	o/head
		2^v	30	26	5			whole	desks			55 min.	o/head
		3	30	28	5			whole	desks			60 min.	o/head
Post In-service (a)	L.Arts	4	30	27	6			2	desks	60 min.	100%	60 min.	
		5^v	30	28	6			2	desks	45 min.	100%	45 min.	
		6^v	30	29	6			2	desks	60 min.	100%	60 min.	
	Math	4^v	30	26	6			whole	desks			60 min.	o/head
		5	30	28	6			whole	desks			55 min.	
		6^v	30	29	6			whole	desks			60 min.	
(b)	LA	7^v	30	27	6			2	desks	45 min.	100%	45 min.	
	M	7^v	30	28	6			whole	desks			60 min.	

Note: v. Lessons videotaped

1. Whole class

Table 6

Information from Observation Schedule Relevant to Class Population, Room Layout, and Grouping. Grade Six

	Subject	Lesson	CLASS POPULATION		DESK ARRANGEMENT			USE OF GROUPS				PERIOD OF OBSERVATION	A.V. EQUIPMENT
			Enrolled	Present	Rows	Groups	Random	Number	Location	Time Used	% of Lesson		
Pre In-service	L.Arts	1	27	26			*	whole[1]	desks			35 min.	
		2^v	27	25			*	whole	desks			40 min.	
		3^v	27	23			*	whole	desks			60 min.	
	Math	1^v	27	26			*	whole	desks			55 min.	
		2^v	27	26			*	whole	desks			60 min.	
		3	27	24			*	whole	desks			55 min.	
Post In-service (a)	L.Arts	4^v	28	22			*	whole	desks			30 min.	
		5^v	28	23			*	whole	desks			75 min.	
		6	27	25			*	whole	desks			55 min.	
	Math	4^v	28	25			*	whole	desks			65 min.	
		5^v	28	25			*	whole	desks			60 min.	
		6	27	24			*	whole	desks			60 min.	
(b)	LA	7^v	28	25			*	whole	desks			50 min.	
	M	7^v	28	27			*	whole	desks			60 min.	

Note: v. Lessons videotaped

1. Whole class

Data in Table 6 indicate that no observable changes occurred in the layout or utilization of the learning space in Grade 6 nor in the grouping mode employed. For the language arts and mathematics lessons observed the desks were arranged randomly, the pupils worked at their desks and instruction was directed at the whole class.

Instructional materials. Tables 7 and 8 summarize the data collected by means of the Instructional Materials Inventory (I.M.I.) section of the Observation Schedule.

With regard to Teacher 3 a range of instructional materials and equipment was used across the observed lessons, with an apparent element of consistency. In addition to the textbook, workbook, worksheets and blackboard Teacher 3 also made use of the overhead projector, feltboard, cards, charts and concrete materials.

There is no evidence in Table 7 on which to infer that Teacher 3 either employed instructional materials differently because the lessons were being videotaped for subsequent stimulated recall purposes, or that use of materials changed during the course of the study.

Data in Table 8 indicate that Teacher 6 employed a more restricted range of instructional materials than Teacher 3, with greater reliance being placed on the textbook and workbook. The blackboard was the major piece of general equipment used. As with Teacher 3, there is no evidence to suggest that this aspect of Teacher 6's classroom behavior changed either because the lessons were being videotaped or because of the impact of the in-service experience.

Teacher - pupil interaction. A contracted version of the Expanded Brophy-Good Teacher-Pupil Dyadic Classroom Observation System

Table 7

Instructional Materials Used During the Observed Lessons. Teacher Three

	Pre In-service		Post In-service (a)		(b)	
	L. Arts	Math	L. Arts	Math	LA	M
GAMES, TOYS, PLAY EQUIPMENT						
Puzzles, Games						
Story Books						
Animals, Other Nature Objects						
INSTRUCTIONAL MATERIALS						
Text	v v x	v x	x v v	v x v	v	v
Workbook	v x	v x	v	v x v		v
Worksheets	v v x	v v	x v v	v x	v	v
Charts	v	x	v	v	v	
Pictures					v	
Film						
Film Strip						
Other	v	v x	x v	v x		v
AUDIO-VISUAL EQUIPMENT						
Television						
Record Player						
Cassette Player						
Overhead Projector		v v x		v		
GENERAL EQUIPMENT						
Children's Own Products Display						
Other Displays For Children						
Magazines						
Achievement Chart						
Sink						
Arts & Crafts Materials						
Blackboard	v x	v x	x v v	v v	v	v
Feltboard		v x		v x v		
Easel						
Other						v

Note: v. Videotaped Lessons x. Non Videotaped Lessons

Table 8

Instructional Materials Used During the Observed Lessons. Teacher Six

	Pre In-service						Post In-service							
							(a)						(b)	
	L. Arts			Math			L. Arts			Math			LA	M
GAMES, TOYS, PLAY EQUIPMENT														
Puzzles, Games														
Story Books														
Animals, Other Nature Objects														
INSTRUCTIONAL MATERIALS														
Text	x	v	v	x	v	v	v				v			v
Workbook	x	v		x	v	v			x		v			
Worksheets								v		v		x	v	v
Charts														
Pictures								v	x					
Film														
Film Strip														
Other	x													
AUDIO-VISUAL EQUIPMENT														
Television														
Record Player														
Cassette Player														
Overhead Projector														
GENERAL EQUIPMENT														
Children's Own Products Display														
Other Displays For Children														
Magazines														
Achievement Chart														
Sink														
Arts & Crafts Materials														
Blackboard		v		x	v	v	v	v	x	v	v	x	v	v
Feltboard														
Easel														
Other														

Note: v. Videotaped Lessons x. Non Videotaped Lessons (the T.M.O. of the Observation Schedule - Appendix D) was used to code sequences of teacher-pupil dyadic interaction. These data are presented in Tables 9, 10 and 11 for Grade 3, and Tables 12, 13 and 14 for Grade 6.

In describing the data recorded on the T.M.O.'s the data for each grade will be considered by subject and then in total, with the objectives of:

i. describing the characteristics of the teacher-pupil dyadic interaction;
ii. identifying evidence of change;
iii. relating the teaching strategies which comprised the substance of the in-service treatment to the observed data.

Grouping Mode: For the duration of the study Teacher 3 used large groups as the basis of instruction in language arts while a whole class approach was adopted in mathematics (Tables 9 and 10). Teacher 6 consistently employed a whole class approach for all of the observed lessons (Tables 12 and 13).

Question Type: With minor inter-lesson variation, Teacher 3 primarily posed product questions. In language arts (Table 9) the pre in-service level of 88 percent product questions decreased to 79 percent in the period immediately following the in-service experience, to rise to 100 percent after one month when a second series of post in-service lessons were observed. In mathematics (Table 10) the percentage of product questions was consistently high in each of the three phases of the study; pre in-service, 100 percent; post in-service (a), 100 percent; and post in-service (b), 97 percent.

TABLE 9

Low Inference Process Data

Language Arts, by Lesson and Total. Teacher Three

				TEACHER-INITIATED INTERACTION																													CHILD-INITIATED INTERACTION															
				GROUPING MODE				QUESTION TYPE				PUPIL SELECTION				QUALITY OF CHILD's ANSWER						TEACHER RESPONSE TO CHILD's ANSWER											TYPE OF INTER-ACTION					TEACHER RESPONSE TO CHILD-INITIATED INTERACTION										
																								TERMINAL						SUS-TAINING																		
		Lesson		One Child	Small Group	Large Group	Whole Class	Product	Process	Choice	Self Ref.	Pre. Sel.	Non Vol.	Volunteer	Call Out	Correct +	Partly + -	Wrong -	Don't Know	No Resp.	Call Out	Praise + +	Criticise - -	Ignore	Affirm	Negate	Process	Give Ans.	Ask Other	Rep. Q. Clue	New Q.	Rep. Ch. Ans.	Question	Comment	Call Out	Relevant	Irrelevant	+ +	- -	0	Delay	Accept	Not Accept	Integrate	Shift	Redirect	Long	Brief
PRE IN-SERVICE		1^{v}	n			*		43				11	3	27	5	31	2			1		4		13	20		4		1	6			6			4	1				1	4		1				2
			%					100				24	6	59	11	91	6			3		12		42	46		9		2	100			100			80	20				17	66		17				100
		2^{v}	n			*		21			11	17	3	9	2	27			1			3		9	21				1	2			7			5	3			1	2	7		2		1	1	3
			%					66			34	55	10	29	6	96			4			11		29	68				3	100			100			62	38			8	15	54		15		8	25	75
		3	n			*		20				6	1	13		16	3		1			1			15		1	1	1	2		1	4		1	5		1		1		4						3
			%					100				30	5	65		80	15		5			5			83		5	5	5	66		33	80		20	100		100		20		80						100
POST IN-SERVICE	(a)	4	n			*		17			12	15	1	14		28						6			28									1		1						1						1
			%					59			41	50	3	47		100						21			100									100		100						100						100
		5^{v}	n			*		29	9			5	6	25		21	3	1	2	2				4	20		1		6	4	2		1		2	2						2						
			%					76	24			14	17	69		72	10	3	7	7				13	65		3		19	66	33		33		67	100						100						
		6^{v}	n			*		33				1	11	21		20	4	1	4	1		2		3	15			1	5	5	2		8	1	4	8					2	9	2					7
			%					100				3	33	64		67	13	3	13	3		8		12	63			4	21	71	29		62	9	31	100					16	69	16					100
	(b)	7^{v}	n			*		29				11	1	21		27	1					3		8	18		1	1			6		3	2	2	5						5		1			1	2
			%					100				33	3	64		96	4					11		29	64		4	4			100		43	29	29	100						83		17			33	67
Summation of Low Inference Process Data Language Arts: Teacher Three.																																																
PRE IN-S.			n					81	-		11	34	7	49	7	74	5		2	1		8		27	56		5	1	3	10		1	17		1	14	4	1		2	3	15		3		1	1	8
			%					88			12	35	7	51	7	90	6		2	1		10		29	61		5	1	3	91		9	94		6	77	23	100		8	12	63		12		4	11	89
POST IN-S.	(a)		n					79	9		12	21	18	60		69	7	2	6	3		8		7	63		1	1	11	9	4		9	2	6	11					2	12	2					8
			%					79	9		12	21	18	61		79	8	2	7	3		11		8	76		1	1	13	69	31		53	12	35	100					12	75	12					10
	(b)		n					29				11	1	21		27	1					3		8	18		1	1			6		3	2	2	5						5		1			1	2
			%					100				33	3	64		96	4					11		29	64		4	4			100		43	29	29	100						83		17			33	67

Note: (a) Observations in April immediately following the In-Service program.

(b) Observations in May, one month after (a).

p. Praise - % of partly and correct answers.

v. Lessons videotaped.

TABLE 10

Low Inference Process Data
Mathematics, by Lesson and Total. Teacher Three

			TEACHER-INITIATED INTERACTION																														CHILD-INITIATED INTERACTION															
			GROUPING MODE				QUESTION TYPE				PUPIL SELECTION				QUALITY OF CHILD's ANSWER						TEACHER RESPONSE TO CHILD's ANSWER											TYPE OF INTER-ACTION					TEACHER RESPONSE TO CHILD-INITIATED INTERACTION										
																							TERMINAL						SUS-TAINING																	
	Lesson		One Child	Small Group	Large Group	Whole Class	Product	Process	Choice	Self Ref.	Pre. Sel.	Non Vol.	Volunteer	Call Out	Correct +	Partly + -	Wrong -	Don't Know	No Resp.	Call Out	Praise + +	Criticise - -	Ignore	Affirm	Negate	Process	Give Ans.	Ask Other	Rep. Q. Clue	New Q.	Rep. Ch. Ans.	Question	Comment	Call Out	Relevant	Irrelevant	+ +	- -	C	Delay	Accept	Not Accept	Integrate	Shift	Redirect	Long	Brief
PRE IN-SERVICE	1^v	n				*	29				21		6		10	8	2				1			7		1			19			1			1						1						
		%					100				72		28		50	40	10				P 5			88		12			100			100			100						100						
	2^v	n				*	32				15	4	10		13	8	9				3			15					17			2	1	1	3				1		3						2
		%					100				52	14	34		43	26	30				14			100					100			50	25	25	100				25		75						100
	3	n				*	32				20	1	11		20	8	3				7		3	17	1				10	2																	1
		%					100				62	3	34		65	26	9				25		14	81	5				83	17																	100
POST IN-SERVICE (a)	4^v	n				*	20				13	1	6		10	8	2				4			7					8	3																	
		%					100				65	5	30		50	40	20				22			100					73	27																	
	5	n				*	16				3		11		13		3				6			13				1				5		3	5					1	6	1					4
		%					100				21		79		81		19				46			93				7				62		38	100					12	76	12					100
	6^v	n				*	23				26		5		26		4	1					1	16					2	9		8		2	8						3						8
		%					100				84		16		84		13	3					6	94					18	82		80		20	100						100						100
POST IN-SERVICE (b)	7^v	n				*	30	1			25		5		16	11	3	1			4		1	9		2		2	12	3		1		1	1						1		1				
		%					97	3			83		17		52	35	10	3			15		7	64		14		14	80	20		50		50	100						50		50				
Summation of Low Inference Process Data Mathematics: Teacher Three.																																															
PRE IN-S.		n					93				56	5	29		43	24	14				11		3	39	1	1			46	2		3	1	1	4				1		4						3
		%					100				62	5	32		53	30	17				16		7	89	2	2			96	4		60	20	20	100				20		80						100
POST IN-S. (a)		n					59				42	1	22		49	8	9	1			10		1	36				1	10	12		13		5	13					1	14	1					12
		%					100				65	1	34		73	12	13	2			18		3	95				3	45	55		72		28	100					6	83	6					100
POST IN-S. (b)		n					30	1			25		5		16	11	3	1			4		1	9		2		2	12	3		1		1	1						1		1				
		%					97	3			83		17		52	35	10	3			15		7	64		14		14	80	20		50		50	100						50		50				

Note: (a) Observations in April immediately following the In-Service program.
(b) Observations in May, one month after (a).

p. Praise - % of partly and correct answers.
v. Lessons videotaped.

TABLE 11

Low Inference Process Data
Comparison by Subject and Total Before and After In-service Program. Teacher Three

				GROUPING MODE				TEACHER-INITIATED INTERACTION																									CHILD-INITIATED INTERACTION															
								QUESTION TYPE				PUPIL SELECTION				QUALITY OF CHILD'S ANSWER						TEACHER RESPONSE TO CHILD'S ANSWER											TYPE OF INTER-ACTION					TEACHER RESPONSE TO CHILD-INITIATED INTERACTION										
																								TERMINAL						SUS-TAINING																		
				One Child	Small Group	Large Group	Whole Class	Product	Process	Choice	Self Ref.	Pre. Sel.	Non Vol.	Volunteer	Call Out	Correct +	Partly + -	Wrong -	Don't Know	No Resp.	Call Out	Praise + +	Criticise - -	Ignore	Affirm	Negate	Process	Give Ans.	Ask Other	Rep. Q. Clue	[illegible]	Rep. Ch. Ans.	Question	Comment	Call Out	Relevant	Irrelevant	+ +	- -	0	Delay	Accept	Not Accept	Integrate	Shift	Redirect	Long	Brief
PRE IN-SERVICE		L. Art	n					81			11	34	7	49	7	74	5		2	1		8		27	56		5	1	3	10		1	17		1	14	4	1		2	3	15		3		1	1	8
			%					88			12	35	7	51	7	90	6		2	1		10[p]		29	61		5	1	3	91		9	94		6	77	23	100		8	12	63		12		4	11	89
		Math.	n					93				56	5	29		43	24	14				11		3	39	1	1			46	2		3	1	1	4				1		4						3
			%					100				62	5	32		53	30	17				16		7	89	2	2			96	4		60	20	20	100				20		80						100
		Total	n					174			11	90	12	78	7	117	29	14	2	1		19		30	95	1	6	1	3	56	2	1	20	1	2	18	4			3	3	19		3		1	1	11
			%					94			6	48	6	42	4	72	18	8	1	1		13		22	70	1	4	1	2	95	3	2	87	4	9	82	18			10	10	66		10		3	8	92
POST IN-SERVICE	(a)	L. Art	n					79	9		12	21	18	60		69	7	2	6	3		8		7	63		1	1	11	9	4		9	2	6	11					2	12	2					8
			%					79	9		12	21	18	61		79	8	2	7	3		11		8	76		1	1	13	69	31		53	12	35	100					12	75	12					100
		Math.	n					59				42	1	22		49	8	9	1			10		1	36				1	10	12		13		5	13					1	14	1					12
			%					100				65	1	34		73	12	13	2			18		3	95				3	45	55		72		28	100					6	88	6					100
		Total	n					138	9		12	63	19	82		118	15	11	7	3		18		8	99		1	1	11	19	16		22	2	11	24					3	26	3					20
			%					87	6		7	38	12	50		77	10	7	5	2		14		7	83		1	1	9	54	46		63	6	31	100					9	81	9					100
	(b)	L. Art	n					29				11	1	21		27	1					3		8	18		1	1			6		3	2	2	5						5		1			1	2
			%					100				33	3	64		96	4					11		29	64		4	4			100		43	29	29	100						83		17			33	67
		Math.	n					30	1			25		5		16	11	3	1			4		1	9		2		2	12	3		1		1	1						1		1				
			%					97	3			83		17		52	35	10	3			15		7	64		14		14	80	20		50		50	100						50		50				
		Total	n					59	1			36		26		43	12	3	1			7		9	27		3	1	2	12	9		4	2	3	6						6		2			1	2
			%					98	2			58		42		73	20	5	2			13		21	64		7	2	5	57	43		27	13	20	40						75		25			33	67

Note: (a) Observations in April immediately following the In-Service program.

(b) Observations in May, one month after (a).

p. Praise - expressed as % of correct answers.

TABLE 12

Low Inference Process Data
Language Arts, by Lesson and Total. Teacher Six

				GROUPING MODE				TEACHER-INITIATED INTERACTION																									CHILD-INITIATED INTERACTION															
								QUESTION TYPE				PUPIL SELECTION				QUALITY OF CHILD's ANSWER						TEACHER RESPONSE TO CHILD's ANSWER											TYPE OF INTER-ACTION					TEACHER RESPONSE TO CHILD-INITIATED INTERACTION										
																								TERMINAL						SUS-TAINING																		
		Lesson		One Child	Small Group	Large Group	Whole Class	Product	Process	Choice	Self Ref.	Pre. Sel.	Non Vol.	Volunteer	Call Out	Correct +	Partly + -	Wrong -	Don't Know	No Resp.	Call Out	Praise + +	Criticise - -	Ignore	Affirm	Negate	Process	Give Ans.	Ask Other	Rep. Q. Clue	New Q.	Rep. Ch. Ans.	Question	Comment	Call Out	Relevant	Irrelevant	+ +	- -	0	Delay	Accept	Not Accept	Integrate	Shift	Redirect	Long	Brief
PRE IN-SERVICE		1	n				*	11				1	1	9	2	10	2			1				1	7		2		2		2			1	3	1						4		1				1
			%					100				8	8	69	15	77	15			8				8	58		17		17		100			25	75	100						80		10				100
		2^v	n				*	9				1		1	7	7	1						1	2	5			1		1					5	4	1					5		2				4
			%					100				11		11	77	88	12						12	25	63			12		100					100	80	20					71		29				100
		3^v	n				*	22	8			6	3	7	11	15	8	1		1			1	1	10	1	7	1	2	7					7	7				1		6		1				5
			%					73	27			22	11	26	41	60	32	4		4			4	5	45	5	32	5	9	100					100	100				12		75		12				100
POST IN-SERVICE	(a)	4^v	n				*	27				1		11	20	12	10					2		5	9		3		9	3				2		2						2		1		1		1
			%					100				3		34	62	55	45					P9		19	35		12		35	100				100		100						50		25		25		100
		5^v	n				*	30	2		10	16		25	2	21	5	11	1			3		1	22	5	1	2	5	4	8		6	3	5	8				1		9						5
			%					71	5		24	37		58	5	55	13	29	3			12		3	61	14	3	6	14	34	66		43	21	36	100				10		90						100
		6	n				*	8				1	2	5		4	4					1			4		2		2				2	10	8	9						7	2	6				2
			%					100				12	25	63		50	50					12			50		25		25				10	50	40	100						47	13	40				100
	(b)	7^v	n				*	4				1		3	1	3	1								2		1		1	1			36	4	9	34	1	4	3			35	1	20			8	16
			%					100				20		60	20	75	25								50		25		25	100			73	8	18	97	3	57	43			63	2	36			33	67
Summation of Low Inference Process Data Language Arts Teacher Six.																																																
PRE IN-S.			n					42	8			8	4	17	20	32	11	1		2			2	4	22	1	9	2	4	8	2			1	15	12	1			1		15		4				10
			%					84	16			16	8	35	41	69	24	2		4			5	9	52	2	21	5	9	80	20			6	94	92	8			5		75		20				100
POST IN-S.	(a)		n					65	2		10	18	2	41	22	37	19	11	1			6		6	35	5	6	6	16	7	8		8	15	13	19				1		18	2	7		1		
			%					84	3		13	22	2	49	27	54	28	16	1			11		8	47	7	8	8	22	47	53		22	42	36	100				3		62	7	24		3		
	(b)		n					4				1		3	1	3	1								2		1		1	1			36	4	9	34	1	4	3			35	1	20			8	16
			%					100				20		60	20	75	25								50		25		25	100			73	8	18	97	3	57	43			63	2	36			33	67

Note: (a) Observations in April immediately following the In-Service program.
(b) Observations in May, one month after (a).
c. % of given answers.
p. Praise - % of partly and correct answers.
v. Lessons videotaped.

TABLE 13

Low Inference Process Data

Mathematics, by Lesson and Total. Teacher Six

				TEACHER-INITIATED INTERACTION																													CHILD-INITIATED INTERACTION															
				GROUPING MODE				QUESTION TYPE				PUPIL SELECTION				QUALITY OF CHILD's ANSWER						TEACHER RESPONSE TO CHILD's ANSWER											TYPE OF INTER-ACTION					TEACHER RESPONSE TO CHILD-INITIATED INTERACTION										
																								TERMINAL						SUS-TAINING																		
		Lesson		One Child	Small Group	Large Group	Whole Class	Product	Process	Choice	Self Ref.	Pre. Sel.	Non Vol.	Volunteer	Call Out	Correct +	Partly + -	Wrong -	Don't Know	No Resp.	Call Out	Praise + +	Criticise - -	Ignore	Affirm	Negate	Process	Give Ans.	Ask Other	Rep. Q. Clue	New Q.	Rep. Ch. Ans.	Question	Comment	Call Out	Relevant	Irrelevant	+ +	- -	0	Delay	Accept	Not Accept	Integrate	Shift	Redirect	Long	brief
PRE IN-SERVICE		1	n				*	25			5	3	1	11	13	15	3	5	1			2	3	1	14	4				5			16		10	16						16		8			2	9
			%					83			17	17	5	61	17	62	12	21	4			[p] 11	[c] 13	5	74	21				100			62		38	100						67		33			18	82
		2[v]	n				*	27				10	4	8	6	16	5		2			1		5	13	1			1	6	1		4		4	8						7	1	2			2	1
			%					100				36	14	29	21	69	22		9			5		25	65	5			5	86	14		50		50	100						70	10	20			67	33
		3	n				*	30	1			26		5		10	10		4				3	4	4	1			5	14			7		1	7	1					7					3	5
			%					97	3			84		16		42	42		17				15	29	29	7			36	100			88		12	88	12					100					37	63
POST IN-SERVICE	(a)	4[v]	n				*	12				6		2	4	10		1				1		6	3						1		18		9	18					1	16	1					16
			%					100				50		16	34	90		10				10		66	34						100		67		33	100					5	90	5					100
		5[v]	n				*	12				3	2	3	4	8	1	3							8				1	2	1		12	1	5	13						12		4			1	3
			%					100				25	16	25	34	67	8	25							89				11	66	34		67	5	28	100						75		25			25	75
		6	n				*	24				7	2	10	5	10	6	2				1			7		4		5	4	3		10	1	7	9				1		10		6				5
			%					100				29	8	42	21	55	33	11				6			43		25		31	57	43		56	5	39	100				6		59		35				100
	(b)	7[v]	n				*	20	2			14		7	1	13	1	5	2					1	10		2	2	1	5	1		6	2	5	8				1		8		2				6
			%					91	9			64		32	4	62	5	24	9					6	62		13	13	6	83	17		46	15	38	100				9		73		18				100
Summation of Low Inference Process Data Mathematics: Teacher Six.																																																
PRE IN-S.			n					82	1		5	39	5	24	9	41	18	5	7			3	6	10	31	6			6	25	1		27		15	31	1					30	1	10			7	15
			%					93	1		6	51	6	31	12	58	25	7	10			5	9	19	58	11			11	96	4		64		36	96	4					73	2	24			32	68
POST IN-S.	(a)		n					48				16	4	15	13	28	7	6				2		6	18		4		6	6	5		40	2	21	40				1	1	39	1	10			1	24
			%					100				33	8	31	27	68	17	15				6		18	53		12		18	55	45		63	3	33	100				2	2	75	2	19			4	96
	(b)		n					20	2			14		7	1	13	1	5	2					1	10		2	2	1	5	1		6	2	5	8				1		8		2				6
			%					91	9			64		32	4	62	5	24	9					6	62		13	13	6	83	17		46	15	38	100				9		73		18				100

Note: (a) Observations in April immediately following the In-Service program.

(b) Observations in May, one month after (a).

c. % of given answers

p. Praise - % of partly and correct answers.

v. Lessons videotaped.

TABLE 14

Low Inference Process Data
Comparison by Subject and Total, Before and After In-service Program. Teacher Six

				GROUPING MODE				TEACHER-INITIATED INTERACTION																									CHILD-INITIATED INTERACTION															
								QUESTION TYPE				PUPIL SELECTION				QUALITY OF CHILD'S ANSWER						TEACHER RESPONSE TO CHILD'S ANSWER											TYPE OF INTER-ACTION					TEACHER RESPONSE TO CHILD-INITIATED INTERACTION										
																								TERMINAL						SUS-TAINING																		
				One Child	Small Group	Large Group	Whole Class	Product	Process	Choice	Self Ref.	Pre. Sel.	Non Vol.	Volunteer	Call Out	Correct +	Partly + -	Wrong -	Don't Know	No Resp.	Call Out	Praise + +	Criticise - -	Ignore	Affirm	Negate	Process	Give Ans.	Ask Other	Rep. Q. Clue	New Q.	Rep. Ch. Ans.	Question	Comment	Call Out	Relevant	Irrelevant	+ +	- -	0	Delay	Accept	Not Accept	Integrate	Shift	Redirect	Long	Brief
PRE IN-SERVICE		L. Art	n					42	8			8	4	17	20	32	11	1		2			2	4	22	1	9	2	4	8	2			1	15	12	1			1		15		4				10
			%					84	16			16	8	35	41	69	24	2		4			[c]5	9	52	2	21	5	9	80	20			6	94	92	8			5		75		20				100
		Math.	n					82	1		5	39	5	24	9	41	18	5	7			3	6	10	31	6			6	25	1		27		15	31	1					30	1	10			7	15
			%					93	1		6	51	6	31	12	58	25	7	10			[p]5	9	19	58	11			11	96	4		64		36	96	4					73	2	24			32	68
		Total	n					124	9		5	47	9	41	29	73	29	6	7	2		3	8	14	53	7	9	2	10	33	3		27	1	30	43	2			1		45	1	14			7	25
			%					90	6		4	37	7	33	23	62	25	5	6	2		3	7	15	55	7	9	2	11	92	8		47	2	51	96	4			2		74	2	23			22	78
POST IN-SERVICE	(a)	L. Art	n					65	2		10	18	2	41	22	37	19	11	1			6		6	35	5	6	6	16	7	8		8	15	13	19				1		18	2	7		1		
			%					84	3		13	22	2	49	27	54	28	16	1			11		8	47	7	8	8	22	47	53		22	42	36	100				3		62	7	24		3		
		Math.	n					48				16	4	15	13	28	7	6				2		6	18		4		6	6	5		40	2	21	40				1	1	39	1	10			1	24
			%					100				33	8	31	27	68	17	15				6		18	53		12		18	55	45		63	3	33	100				2	2	75	2	19			4	96
		Total	n					113	2		10	34	6	56	35	65	26	17	1			8		12	53	5	10	6	22	13	13		48	17	34	59				2	1	57	3	17		1	1	24
			%					90	2		8	26	5	43	27	60	24	16	1			8		11	49	5	9	5	20	50	50		48	17	34	100				2	1	70	4	21		1	4	96
	(b)	L. Art	n					4				1		3	1	3	1								2		1		1	1			36	4	9	34	1	4	3			35	1	20			8	16
			%					100				20		60	20	75	25								50		25		25	100			73	8	18	97	3	57	43			63	2	36			33	67
		Math.	n					20	2			14		7	1	13	1	5	2					1	10		2	2	1	5	1		6	2	5	8				1		8		2				6
			%					91	9			64		32	4	62	5	24	9					6	62		13	13	6	83	17		46	15	38	100				9		73		18				100
		Total	n					24	2			15		10	2	16	2	5	2					1	12		3	2	2	6	1		42	6	14	42	1	4	3	1		43	1	22			8	22
			%					92	8			56		37	7	64	8	20	8					5	60		15	10	10	86	14		68	10	22	98	2	57	43	1		64	1	33			27	73

Note: (a) Observations in April immediately following the In-Service program.
(b) Observations in May, one month after (a).

p. Praise - % of partly and correct answers.
c. Criticise - % of given answers.

When questioning is considered outside of the subject boundaries (Table 11) the occurrence of product questions varied from 94 percent in the pre in-service situation, to 87 percent in the initial post in-service experience, to 98 percent in the post in-service (b) phase.

Questioning by Teacher 6 also focused primarily on product questions. While some variation occurred between lessons, in language arts (Table 12) the pre in-service level of 84 percent product questions remained unchanged in the post in-service (a) observations to rise to 100 percent after one month. In mathematics (Table 13) the higher initial level (93 percent) of product questions rose to 100 percent in the lessons observed immediately post in-service to drop to 91 percent one month following.

When the Grade 6 lessons are considered only by grade (Table 14), product questions account for 90 percent of the questioning both pre and post in-service, and 92 percent after one month (post in-service (b)).

In spite of Teaching Strategy 21 (Appendix A) the percentage of product questions used by both teachers remained disproportionately high. In Grade 3 language arts, where change did occur in the direction advocated in the teaching strategy, the change was negated in the one month period following the post in-service (a) observations. A similar increase after one month was also evidenced in Grade 6 language arts.

Pupil Selection: Teaching Strategy 19 advocated limiting the selection of volunteers to 10 to 15 percent of student choices in question-and-answer sessions, while also discouraging "call-outs".

In Grade 3 most categories of pupil selection were represented in classroom questioning and while marked variations occurred between lessons, in language arts volunteers were selected most frequently.

The pre in-service level of 51 percent of volunteers selected increased to 61 percent over the course of the in-service experience and represented 64 percent of students selected in the post in-service (b) phase (Table 9).

In Grade 3 mathematics, with the exception of lesson 5, pre-selection was the most commonly exhibited basis for pupil selection. The pre in-service level of 62 percent (Table 10) increased slightly to 65 percent in the post in-service (a) observations, to rise dramatically to 83 percent in the lesson observed after the expiry of one month. The different basis for pupil selection in language arts and mathematics is noteworthy.

Paralleling the above change in mathematics was a decrease in the selection of volunteers from 32 percent pre in-service to 17 percent in the final mathematics lesson observed (post in-service (b)). This latter level is consonant with Strategy 19.

When the observations for all of the Grade 3 lessons are summed (Table 11), the percentage of pupils pre-selected was 48 percent pre in-service, 38 percent post in-service (a) and 58 post in-service (b). The corresponding percentages for volunteers was 42 percent, 50 percent, 42 percent, indicating that over the duration of the study Teacher 3 observed a relatively constant approach to the selection of volunteers. This predisposition to select a higher proportion of volunteers than advocated in Teaching Strategy 19 will be supported from statements from the stimulated recall protocols in a subsequent section.

In language arts, Teacher 6 varied the basis for pupil selection and while most categories of pupil selection were observed, overall the most frequent was the selection of volunteers. Notably high however was the frequency with which "call-outs" were accepted (Table 12). The percentage of volunteers increased from the initial level of 35 percent to 49 percent post in-service (a) to 60 percent in the lesson one month later. While this is in the opposite direction from that advocated in Teaching Strategy 19, the percentage of "call-outs" accepted decreased from 41 percent pre in-service to 27 percent post in-service (a) and 20 percent post in-service (b), after one month.

In Grade 6 mathematics pre-selection was the most common basis for pupil selection, with the pre in-service percentage of 51 percent decreasing in the post in-service (a) situation to 33 percent, to increase to 64 percent in the post in-service (b) observation (Table 13). The post in-service (a) drop in pre-selection was matched by a significant increase in the acceptance of "call-outs" which rose from 12 percent to 27 percent. One month later the level of "call-outs" was recorded at 4 percent. Whereas the post in-service (a) increase did not support Teaching Strategy 19, the overall change did. The selection of volunteers remained virtually unchanged over the course of the study.

When the observations for all of the Grade 6 lessons are summed (Table 14) the percentage of students pre-selected was 37 percent pre in-service, 26 percent post in-service (a) and 56 percent post in-service (b). The corresponding figures for volunteers were 33 percent, 43 percent, 37 percent. Over the in-service experience the percentage of "call-outs" increased from 23 percent to 27 percent, however in the observations held one month subsequently "call-outs" had decreased to 7 percent.

In the overall teaching strategy of Teacher 6 the proportion of volunteers selected remained higher than that propounded in Teaching

Strategy 19. This feature will be discussed subsequently in the light of statements contained in the stimulated recall protocols. Over the period of the study however, Teacher 6 did employ pre-selection more frequently as the basis of pupil selection, and accepted "call-outs" less frequently.

The different basis for pupil selection in language arts and mathematics identified in Grade 3 is also evident in Grade 6 with the use of volunteers more common in language arts and pre-selected pupils in mathematics.

Praise and Criticism: Teaching Strategies 22 and 23 addressed the issue of teacher praise and criticism as a means of conveying encouragement and communicating expectations.

The low incidence with which Teacher 3 used praise in language arts is evident from Table 9. Teacher praise was observed on only nineteen occasions in seven lessons with 10 percent of correct and partly correct answers being praised in the pre in-service situation. This percentage increased and remained constant at 11 percent post in-service. Criticism was not recorded in any Grade 3 language arts lesson.

A similar situation exists with regard to Grade 3 mathematics (Table 10), where in seven lessons twenty five cases of praise and no cases of criticism were recorded. In lesson 5, 46 percent of correct and partly correct answers were praised which represents a marked departure from the general pattern established in the observed mathematics lessons.

Over the duration of the study use of praise by Teacher 3 varied little in mathematics lessons, increasing from a pre in-service level of 16 percent, to 18 percent post in-service (a) and decreasing to 15 percent after a further month.

The composite picture to emerge when all Grade 3 lessons are considered (Table 11) is little different. The overall pre in-service level of praise of 13 percent of correct and partly correct responses increased to 14 percent over the in-service experience to return to 13 percent after one month.

Teacher 6 was recorded as using praise on only six occasions in the seven language arts lessons observed and in the same period used criticism only twice (Table 12). In both instances the criticism occurred prior to the in-service program with no criticism being recorded after that event. In contrast, Teaching Strategy 22 advocating the use of praise, appears to have impacted Teacher 6's behavior for all cases of praise recorded occurred after the in-service course. However the highest percentage of correct and partly correct responses for which praise was given was 12 percent.

The use of praise by Teacher 6 in mathematics lessons was even more sparing with only five cases being recorded, however these occurred both before and immediately after the in-service course. No praise was recorded in the mathematics lesson observed one month later.

Criticism was used a little more frequently in mathematics than in language arts by Teacher 6 but all instances occurred prior to the in-service program. Of the pupil responses 9 percent were the subject of criticism.

Teaching Strategies 22 and 23 appear to have had little impact on the teaching behaviors manifest by Teacher 3, and only a minor impact on Teacher 6 who, while making greater use of praise after the in-service experience, was not observed to use either praise or criticism in the lessons observed one month after the in-service program.

Teacher Response - Terminal/Sustaining:

Teaching Strategy 20 states:

> Teachers should aim at getting the child to give some kind of response to a question. Rephrasing, giving clues or asking a new question can be useful techniques for bringing forth some answers from a previously silent pupil or one who says, "I don't know", or answers incorrectly.

With respect of teacher response to pupil's answers, Tables 9 to 14 contain rich data which could be discussed profitably in terms of the individual terminating or sustaining behaviors exhibited by the teachers and changes which occurred in these over the period of the study. However with the objective of identifying changes in teacher behavior attributable to the intervention program, the data will be presented in terms of Teaching Strategy 20, by focusing on the ratio of sustaining to terminal teacher responses. This information has been extracted and presented in Table 15.

In language arts Teacher 3 displayed a low but increasing percentage of sustaining responses over the duration of the study. A higher proportion of sustaining responses was provided in mathematics but this proportion decreased from a pre in-service level of 52 percent to 37 percent immediately following the intervention program, to return to the initial level after the elapse of one month. When all of the lessons observed in Grade 3 are considered collectively the initial level (30 percent) registered a decrease immediately after the in-service experience to 23 percent. After a further month the percentage of sustaining responses increased marginally beyond the initial level to 33 percent. While in language arts the teacher's behavior changed in the direction advanced in Teaching Strategy 20, in both mathematics and for the total Grade 3 lessons the in-service experience was followed by an initial drop in percentage of sustaining responses. After a further month the teacher was exhibiting sustaining responses at the pre in-service level.

For Grade 6 language arts, mathematics and the lessons in total, the initial percentages of sustaining behavior dropped after the in-service experience. In all cases the observations conducted one month after the post in-service (a) phase reflected a subsequent increase, although, only in language arts did the final percentage of sustaining responses regain the initial level.

Table 15

Sustaining Responses Expressed as a Percentage of Total Teacher Responses to Pupil Answers

	Teacher 3			Teacher 6		
	L. Arts	Math	Total Lessons	L. Arts	Math	Total Lessons
Pre In-service	11	52	30	19	33	27
Post In-service (a)	14	37	23	17	24	19
Post In-service (b)	18	52	33	20	27	26

High Inference Data

The teaching strategies which comprised the in-service program were incorporated into the Observation Schedule (Appendix D) in the form of thirty one five-point rating scales. Judgments concerning these teaching behaviors were recorded at the completion of each lesson. Means for each strategy were calculated for each teacher in the language arts and mathematics lessons observed before the in-service experience (pre in-service), immediately following (post in-service (a)) and after one month (post in-service (b)).

In order to address the question of change in teacher behavior the differences in the means of the three observation periods were calculated and are presented in Table 16. Due to the fact that the relatively small number of observations involved in the study preclude the use of statistical tests to assess the significance of change, any change equal to, or greater than 0.5 was considered significant. On a five-point scale this represents a change of at least 12.5 percent.

Table 17 summarizes both the extent and direction of change that occurred. The pattern of change which occurred over the three observation periods is encapsulated in Table 20.

Although an aspect of this study addresses whether change occurred in overt teacher behavior, full amplification of the data contained in Tables 16 and 17 is beyond the scope of this study, however by way of description several features of the change will be highlighted.

From Tables 16 and 17 it is evident that while change occurred over the period of the study the nature of the change was complex.

Table 16

High Inference Data

Differences in Mean Ratings

Abbreviated Statement of the Teaching Strategies (from Rating Scales - Appendix D)	Teacher 3						Teacher 6					
	Language Arts			Mathematics			Language Arts			Mathematics		
	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b
1. System of rules for personal/ procedual matters	-0.33	1.67*	1.33*	-0.67*	0.67*	0.00	-0.67*	0.67*	0.00	0.00	0.00	0.00
2. Prevent misbehavior	-0.67*	1.67*	1.00*	-0.67*	0.67*	0.00	-0.67*	0.67*	0.00	-0.33	0.33	0.00
3. Accurate disciplinary action	-0.33	1.33*	1.00*	-0.67*	0.67*	0.00	0.00	0.00	0.00	0.00	1.00*	1.00*
4. Monitoring of seatwork	0.67*	0.33	1.00*	0.33	0.00	0.33	-0.67*	1.67*	1.00*	-1.00*	1.00*	0.00
5. Low-key handling of disruption	0.33	0.33	0.67*	-0.67*	0.00	-0.67*	-0.33	0.00	-0.33	0.33	0.33	0.67*
6. Assignments interesting and worthwhile	0.00	0.00	0.00	-0.33	1.00*	0.67*	-0.33	1.00*	0.67*	1.33*	-0.67*	0.67*
7. System of rules for learning tasks	1.00*	0.00	1.00*	-0.33	0.00	-0.33	-1.00*	2.00*	1.00*	0.00	0.67*	0.67*

Table 16 (continued)

Abbreviated Statement of the Teaching Strategies (from Rating Scales - Appendix D)	Teacher 3						Teacher 6					
	Language Arts			Mathematics			Language Arts			Mathematics		
	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b
8. Optimization of academic time	-0.33	1.67*	1.33*	0.00	1.33*	1.33*	-1.00*	2.33*	1.33*	-0.33	0.00	0.33
9. Standard signal for attention	0.00	0.33	0.33	-0.67*	0.67*	0.00	0.00	0.33	0.33	1.00*	0.33	1.33*
10. Wait for pupil attention	-0.33	0.33	0.00	0.33	0.00	0.33	0.33	-1.00*	-0.67*	0.67*	0.33	1.00*
11. Stop speaking until attention	0.33	0.33	0.67*	0.00	0.33	0.33	0.33	-1.00*	-0.67*	0.00	-0.33	-0.33
12. Variety of instructional techniques	-0.33	1.33*	1.00*	0.00	0.33	0.33	-0.67*	0.67*	0.00	-0.33	0.67*	0.33
13. Encourage quality & quantity of work	0.00	-1.00*	-1.00*	N.A.	N.A.	N.A.	-0.50*	0.50*	0.00	N.A.	N.A.	N.A.
14. Spot checking assignments	-0.67*	+N.O.*	N.O.*	0.33	0.33	0.67*	-2.00*	2.00*	0.00	-0.67*	1.00*	0.33
15. Math games related to concepts	N.A.	N.A.	N.A.	0.67*	0.33	1.00*	N.A.	N.A.	N.A.	1.33*	N.O.*	N.O.*
16. Teacher increases written work	N.O.	N.O.	N.O.	N.A.	N.A.	N.A.	N.O.	N.O.	N.O.	N.A.	N.A.	N.A.

Table 16 (continued)

Abbreviated Statement of the Teaching Strategies (from Rating Scales - Appendix D)	Teacher 3						Teacher 6					
	Language Arts			Mathematics			Language Arts			Mathematics		
	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b
17. Transition concrete to abstract	0.67*	0.33	1.00*	0.33	0.00	0.33	-1.50*	0.00	-1.50*	-0.50*	0.00	-0.50*
18. Appropriate mixture of high & low order questions	0.33	0.67*	1.00*	1.00*	0.33	1.33*	-0.67*	N.O.*	N.O.*	-0.33	0.00	-0.33
19. Awareness of what is going on	0.33	1.00*	1.33*	0.00	1.00*	1.00*	-0.67*	1.00*	0.33	0.00	0.33	0.33
20. Attend to more than one issue at a time	0.00	0.33	0.33	0.33	0.33	0.67*	-0.67*	0.00	-0.67*	0.33	1.33*	1.67*
21. Smooth flow of lesson	-0.67*	1.33*	0.67*	0.00	0.33	0.33	-0.17	-0.50*	-0.67*	-0.67*	1.00*	0.33
22. Pace of lesson	-0.67*	1.67*	1.00*	-1.00*	1.00*	0.00	-1.33*	1.67*	0.33	-0.33	0.67*	0.33
23. Clarity of presentation	0.67*	0.00	0.67*	0.33	0.00	0.33	-0.67*	1.00*	0.33	0.00	-1.00*	-1.00*
24. Able to motivate pupils	0.00	1.67*	1.67*	0.00	0.33	0.33	-1.00*	2.33*	1.33*	1.00*	-0.67*	0.33
25. Caring, accepting valuing	0.00	0.33	0.33	0.33	0.00	0.33	-0.67*	2.00*	1.33*	0.33	0.33	0.67*

Table 16 (continued)

Abbreviated Statement of the Teaching Strategies (from Rating Scales - Appendix D)	Teacher 3						Teacher 6					
	Language Arts			Mathematics			Language Arts			Mathematics		
	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b
26. Accurate response to meanings, feelings, experiences	-0.33	2.00*	1.67*	0.33	0.67*	1.00*	-0.67*	1.00*	0.33	0.67*	0.33	1.00*
27. Different pupils selected for questions	0.33	0.33	0.67*	0.33	-0.67*	-0.33	-1.00*	0.00	-1.00*	-1.00*	N.O.*	N.O.*
28. Rephrasing questions when incorrect response	-0.67*	N.O.*	N.O.*	-1.67*	1.67*	0.00	0.00	-0.67*	-0.67*	-0.67*	2.33*	1.67*
29. Praise	-1.17*	0.67*	-0.50*	0.00	0.33	0.33	-0.17	-0.33	-0.50*	0.00	0.33	0.33
30. Mild criticism	-0.33	-0.67*	-1.00*	0.50*	1.50*	2.00*	0.33	1.00*	1.33*	-1.67*	N.O.*	N.O.*
31. Acceptance of pupil initiated interaction	-1.00*	-0.67*	-1.67*	1.00*	-1.00*	0.00	0.00	0.00	0.00	0.00	N.O.	N.O.

Note: Pre. Pre in-service program

* Significant change

+ Where the rating on a variable for the post in-service (b) observation was N.O. the Pre - Post (a) level of change is assumed to have been maintained.

N.A. Not Applicable

N.O. Not Observed

Change pre in-service to post in-service (a). Over this period significant changes of behavior occurred with both teachers in both subject areas, the notable feature of which was the outnumbering of significant positive changes by significant negative changes (Table 17). For Teacher 6 in language arts the eighteen teaching strategies on which a significant change was observed were all in the opposite direction from that advocated in the teaching strategies.

With Teacher 3 only four strategies (2, 22, 28, 31) registered a significant change in both subject areas, indicating that the change which did occur was spread widely across the strategies. This characteristic was also reflected with Teacher 6 for whom thirty one significant changes occurred in total in the two subject areas. Of these only on six strategies (4, 14, 17, 24, 26, 27) did the change occur in both subject areas. For Teacher 3 Teaching Strategy 31, and Teacher 6 Teaching Strategies 24 and 26 the change was significant but in the opposite direction for the two subject areas.

Change post in-service (a) to post in-service (b). This index represents the change which occurred in the month subsequent to the observations which followed the in-service experience. During this period neither the researcher nor coder had contact with the teachers who it is therefore assumed were exposed to their usual teaching and professional milieu. From Table 17 the increase in the number of strategies in which a significant change was observed with both teachers is apparent. This suggests the significance of the intervening month as a period of flux, readjustment or reflection in which the teachers attempted to incorporate the strategies into their repertoire of teaching behaviors and either accepted or rejected them, or

Table 17

High Inference Data

Direction of Significant Changes in Behavior on Teaching Strategies

	Teacher 3						Teacher 6					
	Language Arts			Mathematics			Language Arts			Mathematics		
	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b	Pre Post a	Post a Post b	Pre Post b
Significant Positive	4	12	18	4	11	9	-	17	7	6	10	11
Significant Negative	7	5	6	7	2	1	18	4	9	7	5	4
Significant Change of Behavior	11	17	24	11	13	10	18	21	16	13	15	15

experimented with the strategies and on the basis of perceived reinforcement either included or rejected them from their repertoire.

The outstanding characteristic of the change identified over this period was the proportion of significant change which was positive in direction. This varied from 67 percent of the change for Teacher 6 in mathematics to 81 percent for the same teacher in language arts. (Table 17).

The significance of the impact of the intervening period is further suggested by:

i. the number of strategies in which significant change occurred between post in-service (a) and post in-service (b) but not between pre in-service and post in-service (a); that is, was not apparent immediately following the in-service experience but was identified after one month. For Teacher 3 in language arts ten such cases occurred, and in mathematics, five. With Teacher 6 six occurred in both language arts and mathematics. For these cases this situation is further amplified in Table 18 where the direction of change between post in-service (a) and post in-service (b) is traced relative to the change which occurred pre in-service to post in-service (a).

Of significance are those strategies where the subsequent change was in the opposite direction from the change recorded immediately after the in-service program. The dimension of the change in a change pattern such as this would be masked if only the difference between the pre in-service and post in-service (b) levels was considered.

ii. the number of strategies for which significant but opposite change was recorded between the pre in-service - post in-service (a)

Table 18

High Inference Data

Direction of Change Where Significant Change Occurred Between Post In-service (a) - Post In-service (b) but Not Pre In-service - Post In-service (b)

Direction of Change	Teacher 3		Teacher 6		Total
	L. Arts	Math	L. Arts	Math	
Same	3	1	2	1	7
Opposite	5	2	3	2	12
Original was Zero	2	2	1	3	8
Total	10	5	6	6	27

Table 19

High Inference Data

Comparison by Direction of Significant Change Pre In-service - Post In-service (a) and Post In-service (a) - Post In-service (b)

Direction of Change	Teacher 3		Teacher 6	
	L. Arts	Math	L. Arts	Math
Same	3	1	1	3
Opposite	4	7	14	6

observations and post in-service (a) - post in-service (b) observations. These data are summarized in Table 19.

Change pre in-service to post in-service (b). This measure reflects not only the change which occurred over the duration of the study but also provides a measure of the stability of the change. From Table 17 it is apparent that for each subject area in both grades, overall there was a high incidence of significant change, most of which was positive. The notable exception is for Teacher 6 in language arts where of the sixteen teaching strategies on which significant change occurred, nine were in the direction opposite from that advocated in the teaching strategies.

A feature to which attention should be drawn is the case where the overall change between pre in-service and post in-service (b) is zero, although change was registered at the other point of measurement, i.e. post in-service (a). This occurred for Teacher 3 in language arts with Teaching Strategy 10, and in mathematics with Teaching Strategies 1, 2, 3, 9, 22, 28, 31; and for Teacher 6 in language arts with Teaching Strategies 1, 2, 12, 13, 14, and in mathematics with Teaching Strategies 2 and 4. In each instance this masked change from the post in-service (a) - post in-service (b) situation which was equal to, but opposite from the initial pre in-service - post in-service (a) difference. In all such cases except for Teacher 3 with Teaching Strategy 31 in mathematics an initial drop in score was followed after one month by an increase to the initial level. This further highlights the apparent importance of the period immediately following the in-service program.

Patterns of change. Further insight into the apparent impact of the time period which elapsed between post in-service (a) and post in-service (b) is afforded from inspection of the patterns of change presented in Table 20. These data are further reduced in Table 21 from which it is evident that the change pattern characterized by Groups A, C and D, where the direction of the original change is maintained or increased, accounts for the change patterns for 40.4 percent of the strategies for Teacher 3, 33.8 percent for Teacher 6 and 37.1 percent for the ratings of Teachers 3 and 6 combined.

Groups B, E and F, where the direction of original change altered in the month between post in-service (a) and post in-service (b), account for 50 percent of the change in the ratings of Teacher 3, 51.6 percent for Teacher 6 and 50.8 percent for Teachers 3 and 6. These figures attest to the extent to which the one month time period which elapsed between post in-service (a) and post in-service (b) impinged on the scores on the high inference data.

Subject area and change. From data in Table 16 it would appear that change in the overt use of a teaching strategy was subject area related, for significant change in the same direction in both language arts and mathematics was registered only on four teaching strategies (8, 18, 19, 26) by Teacher 3 and on six (7, 17, 18, 25, 26, 27) by Teacher 6. This suggests that where change occurred the teaching strategies were adopted into a subject context rather than into the general teaching style of the teacher. This observation is further supported by the occassions in the data where a teacher's overt behavior on a specific teaching strategy changed in opposite directions for language arts and mathematics. This occurred with Teacher 3 on

Table 20

High Inference Data

Patterns of Change in High Inference Data

Group	Pattern of Change			Teacher 3				Teacher 6				Total 3 & 6	
				Language Arts		Mathematics		Language Arts		Mathematics			
	Pre In-s	Post (a)	Post (b)	Strategy	%	Strategy	%	Strategy	%	Strategy	%	n	%
A	1. ORIGINAL No change	ORIGINAL	ORIGINAL	6	3.2			3, 31	6.5	1	3.2	4	3.2
B	2. ORIGINAL Initial decrease, subsequent increase to original level	LOWER	ORIGINAL	10	3.2	1, 2, 3, 9, 22, 28	19.4	1, 2, 12, 13, 14	16.1	2, 4	6.5	14	11.3
	3. ORIGINAL Initial decrease, subsequent increase to lower than original level	LOWER	ORIGINAL (lower)	29	3.2							1	0.8
	4. ORIGINAL Initial decrease, subsequent increase above original level	LOWER	ORIGINAL (higher)	1, 2, 3, 8, 12, 21 22, 26	25.8	6	3.2	4, 6, 7, 8, 19, 22 23, 24, 25, 26	32.3	12, 14, 21, 22, 28	16.1	24	19.4

Table 20 (continued)

Group	Pattern of Change			Teacher 3				Teacher 6				Total 3 & 6	
				Language Arts		Mathematics		Language Arts		Mathematics			
	Pre In-s	Post (a)	Post (b)	Strategy	%	Strategy	%	Strategy	%	Strategy	%	n	%
C	5. ORIGINAL Initial decrease maintained	LOWER	LOWER (same)			5, 7	6.5	5, 17, 20 27	12.9	17, 18	6.5	8	6.4
	6. ORIGINAL Continuing decrease	LOWER	LOWER	30, 31	6.5			21, 29	6.5			4	3.2
D	7. ORIGINAL Initial increase maintained	HIGHER	HIGHER (same)	7, 23	6.5	4, 10, 17 23, 25	16.1			5, 8	6.5	9	7.3
	8. ORIGINAL Continuing increase	HIGHER	HIGHER	4, 5, 11, 17, 18, 19, 27	22.6	14, 15, 18, 20 26, 30	19.4	30	3.2	9, 10, 20 25, 26	16.1	19	15.3
	9. ORIGINAL Initial increase, subsequent decrease to higher than original level	HIGHER	HIGHER (less)							6, 24	6.5	2	1.6

Table 20 (continued)

Group	Pattern of Change			Teacher 3				Teacher 6				Total 3 & 6	
				Language Arts		Mathematics		Language Arts		Mathematics			
	Pre In-s	Post (a)	Post (b)	Strategy	%	Strategy	%	Strategy	%	Strategy	%	n	%
E	10. ORIGINAL Initial increase, subsequent decrease below original level	HIGHER	LOWER			27	3.2	10, 11	6.5			3	2.4
	11. ORIGINAL Initial increase, return to original level	HIGHER	ORIGINAL			31	3.2					1	0.8
F	12. ORIGINAL Initial level maintained, subsequent increase	ORIGINAL	HIGHER	9, 20, 24 25	12.9	8, 11, 12 19, 21, 24, 29	22.6	9	3.2	3, 7, 19 29	12.9	16	12.9
	13. ORIGINAL Initial level maintained, subsequent decrease	ORIGINAL	LOWER	13	3.2			28	3.2	11, 23	6.5	4	3.2
G	Strategies coded as Not Observed or Not Applicable			14, 15, 16, 28	12.9	13, 16	6.5	15, 16, 18	9.7	13, 15, 16, 27 30, 31	19.4	15	12.1

Table 21

High Inference Data

Groupings of Change Patterns by Percentage of Total Change

Description of the Change Pattern	Teacher 3			Teacher 6			Grades 3 & 6 Total
	L. Arts	Math	Total	L. Arts	Math	Total	
A. No change	3.2		1.6	6.5	3.2	4.8	3.2
B. Initial decrease, subsequent increase to approximate original level.	32.3	22.6	27.4	48.4	22.6	35.5	31.5
C. Initial decrease continued or maintained.	6.5	6.5	6.5	19.4	6.5	12.9	9.7
D. Initial increase maintained or increased.	29.0	35.5	32.3	3.2	29.0	16.1	24.2
E. Initial increase, subsequent decrease to initial (or lower) level.		6.5	3.2	6.5		3.2	3.2
F. Original level after in-service, subsequent change.	16.1	22.6	19.4	6.5	19.4	12.9	16.1
G. Strategies coded as Not Observed or Not applicable	12.9	6.5	9.7	9.7	19.4	14.5	12.1

Teaching Strategies 5, 7, 27, 29, 30 and with Teacher 6 on Teaching Strategies 5, 10, 20, 29, 30. This means, by way of example, that while Teacher 3 decreased the use of criticism in language arts, he increased the incidence of criticism in mathematics.

The events surrounding specific lessons are of little relevance in this regard due to the fact that the data reflects mean ratings for each strategy at the three observation points in the study.

Teacher Planning

As an element of the pre-instructional interviews conducted prior to the commencement of each lesson, the teachers were asked to reveal the planning phases followed in the development of the lesson plan and the sequence in which these phases were considered. These were taken to reflect the teacher's pre-active decision making. Transcripts of these interviews were analyzed for the purpose of:

1. describing the planning phases addressed by the teachers in the preparation of lessons;
2. identifying whether change occurred over the duration of the study either in the phases considered by the teachers when planning a lesson, or in the sequence in which the phases were addressed.

A summary of these data is presented in Tables 22 and 23.

Teacher 3 reported considering a wide range of lesson components in the planning of lessons, and from inspection of Table 22 this characteristic does not appear to have been impacted by the in-service experience. However, systematic change which does become apparent after the in-service program is the reporting that lesson objectives were the

Table 22

Preactive Lesson Planning Indicating Components
and Sequence in which Considered. Teacher Three

	CHRONOLOGICAL SEQUENCE OF LESSONS										SEQUENCE OF LESSONS BY SUBJECT									
											Language Arts					Mathematics				
	Pre In-service				Post In-service (a)				(b)		Pre In-s		Post In-s (a)		(b)	Pre In-s		Post In-s (a)		(b)
OBJECTIVES						1	1	1	1	1			1	1	1				1	1
CONTENT	2	1									2					1				
LEARNING ACTIVITIES	3		1	2	2		3	3	3		3	1		3			2	2	3	3
MATERIALS		2	3						2	3		3			3	2				2
DIAGNOSIS																				
EVALUATION					3			4						4				3		
ORGANIZATION																				
TEACHING STRATEGIES																				
Motivation/Introduction	1			1	1	2		2		2	1		2	2	2		1	1		
Demonstration							2												2	
Introductory Vocabulary			2									2								
Questioning						3							3							
Use of Equipment		3														3				
Method																				

Table 23

Preactive Lesson Planning Indicating Components and Sequence in which Considered. Teacher Six

	CHRONOLOGICAL SEQUENCE OF LESSONS										SEQUENCE OF LESSONS BY SUBJECT									
											Language Arts					Mathematics				
	Pre In-service				Post In-service						Pre In-s		Post In-s			Pre In-s		Post In-s		
					(a)				(b)				(a)		(b)			(a)		(b)
OBJECTIVES																				
CONTENT	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1
LEARNING ACTIVITIES			1														1			
MATERIALS										2					2					
DIAGNOSIS																				
EVALUATION																				
ORGANIZATION																				
TEACHING STRATEGIES																				
Motivation/Introduction																				
Demonstration																				
Introductory Vocabulary																				
Questioning																				
Use of Equipment																				
Method	2	2		2	2	2	2	2	2		2	2	2	2		2		2	2	2

first element addressed in planning. Once adopted, this behavior remained unaffected throughout the remainder of the study.

Concern over classroom control and management (to be discussed in subsequent sections) is possibly reflected in the planning priority afforded to motivation and lesson introduction which retained prominence for the duration of the study.

The lesson component to which most consistent reference was made was learning activities and this retained relative prominence after the in-service program.

The most striking feature of the planning strategies reported by Teacher 6 (Table 23) is the consistency of approach to the planning of lessons in the study. Basically only two facets of lesson planning were considered, namely content and teaching strategies. The teacher's use of prepared curriculum material and teachers' manuals may account for this planning practice. Teacher 6's approach to planning is epitomized by:

> T6.6: Generally I just looked to see which lesson was next in the textbook or in my teacher's book to see what was there and [I] decided that it was a worthwhile lesson to pursue and then just decided that an oral discussion would be the best way to go.

From this statement and the data presented in Table 23 it can be inferred that the planning strategies employed by Teacher 6 were not impacted by the teaching strategies addressed in the in-service program. Analysis of the stimulated recall protocols reveals, both in the micro-analysis of interactive thoughts and the macro-analysis of interactive and non-interactive thoughts, frequent reference by Teacher 6 to lesson preparation. Thoughts related to preparation were reported in 6 of the 10 protocols, commonly reflecting dissatisfaction with personal preparation.

> T6.6: I'm admitting a weakness here in that if I'd looked at the lesson beforehand I would have seen that's exactly what they were pointing to.

Stimulated Recall Data

To capitalize fully on the richness of the data contained in the stimulated recall protocols two levels of analysis were undertaken. The first involved micro-analysis of the teachers' interactive thoughts using a content analysis system, and the second a macro or global analysis of all of the teacher thoughts contained in the protocols.

MICRO-ANALYSIS OF INTERACTIVE THOUGHTS

The transcripts of the stimulated recall interviews conducted with the two teachers participating in this study were analyzed using the content analysis system outlined in Chapter IV and detailed in Appendix G. This analysis, focusing on the units of interactive thought contained in the protocols, is presented in summary in Tables 24 and 25.

Analysis of these tables reveals that despite variations in the percentage of teacher thoughts within the categories for the ten lessons for each teacher, the overall percentage for each category is similar for both Teacher 3 and Teacher 6. The most frequently reported interactive thoughts were in the categories of Instructional Strategies - Methodology, Instructional Strategies - Classroom Management and Control, Perceptions and Interpretations which account overall for 72.2 percent of the interactive thoughts of Teacher 3 and 65.5 percent of Teacher 6. While this represents the general case across the ten lessons which comprise the study, within individual lessons departures from this

Table 24

SUMMARY OF MICRO-ANALYSIS OF PROTOCOLS

Percentage Distribution of Teacher Thoughts
over All Categories for Each Lesson - Teacher Three

Thought Category	Pre In-service				Post In-service (a)				Post In-s (b)		Overall*
	1	2	3	4	5	6	7	8	9	10	
1. Instructional Strategies-Methodology	19.8	16.9	23.6	18.2	20.6	22.0	19.1	26.7	26.6	26.1	21.8
2. Instructional Strategies-Classroom Management and Control	14.5	19.6	21.3	15.5	32.6	18.7	21.9	15.1	13.0	12.0	18.4
3. Instructional Strategies-Lesson Content	8.4	0.9	8.7	7.4	0.7	4.8	4.2	5.2	2.7	2.1	4.3
4. Perceptions	8.4	19.2	15.7	12.2	11.3	17.2	16.7	13.4	12.0	16.2	14.6
5. Interpretations	20.6	21.0	12.6	22.3	12.8	8.1	16.7	20.3	18.5	22.5	17.4
6. Pupil Information	7.6	9.1	1.6	11.5	6.4	14.4	7.9	9.9	16.8	8.5	9.8
7. Feelings	6.9	5.0	4.7	2.0	2.8	6.7	8.8	6.9	3.8	8.5	5.7
8. Self Awareness	4.6	3.2	9.4	3.4	7.1	5.7	1.4	1.2	2.2	1.4	3.7
9. Beliefs	6.9	3.7	0.8	7.4	3.5	1.9	2.8	1.2	2.7	2.1	3.2
10. Non-Task-Related Thoughts	2.3	1.4	1.6		2.1	0.5	0.5		1.6	0.7	1.0
n	131	219	127	148	141	209	215	172	184	142	1688

Note: n. Total number of interactive thoughts reported in each stimulated recall interview.

* Total thought units for each category expressed as a percentage of the total thought units reported in the ten lessons.

Table 25

SUMMARY OF MICRO-ANALYSIS OF PROTOCOLS

Percentage Distribution of Teacher Thoughts
over All Categories for Each Lesson - Teacher Six

Thought Category	Pre In-service				Post In-service (a)				Post In-s (b)		Overall*
	1	2	3	4	5	6	7	8	9	10	
1. Instructional Strategies-Methodology	30.4	26.2	28.8	29.0	22.7	21.2	26.4	29.8	10.4	27.3	24.9
2. Instructional Strategies-Classroom Management and Control	14.3	22.7	17.6	13.0	12.9	11.9	13.2	7.1	13.7	17.0	15.3
3. Instructional Strategies-Lesson Content	8.9	3.9	8.5	5.8	4.6	3.4	9.4	1.2	2.6	2.3	5.1
4. Perceptions	8.0	9.6	9.2	13.0	14.4	12.7	15.1	8.3	20.7	13.6	12.3
5. Interpretations	7.1	8.7	12.4	14.5	10.3	20.3	9.4	16.7	17.2	22.7	13.0
6. Pupil Information	11.6	11.4	10.5	5.8	8.2	6.8	6.6	11.9	7.8	5.7	9.0
7. Feelings	11.6	7.4	8.5	11.6	11.3	8.5	13.2	5.9	18.1	9.1	10.3
8. Self Awareness	4.5	3.5	1.3	4.3	7.2	9.3	5.7	14.1	4.3	1.1	5.3
9. Beliefs	2.7	0.4				1.7		1.2	3.4		0.9
10. Non-Task-Related Thoughts	0.9	6.1	3.3	2.9	8.2	4.2	0.9	3.8	1.7	1.1	3.9
n	112	229	153	69	194	118	106	84	116	88	1269

Note: n. Total number of interactive thoughts reported in each stimulated recall interview.

* Total thought units for each category expressed as a percentage of the total thought units reported in the ten lessons.

generalization may be observed.

The categories of the content analysis system were further analyzed according to substantive components in order to:

1. address the research questions related to change in teachers' interactive thoughts;
2. highlight changes masked by broader grouping;
3. explore the richness of the data contained in the protocols in order that this study might be both exploratory and descriptive and provide the basis for the generation of further hypotheses.

Substantive Components of Instructional Strategies - Methodology

Teacher interactive thoughts related to teaching techniques and strategies employed in conducting lessons were coded in this category and further analyzed in order to identify the substantive components which constitute the foci of such thoughts.

When the ten lessons for each teacher are viewed in total, between one-fifth and one-quarter of all interactive thoughts reported in the protocols are accounted for in this category (Tables 24 and 25).

For Teacher 3 the percentage of thoughts coded in this category varied from 16.9 percent to 26.7 percent (Table 24), which over the course of the study, represents a consistently high proportion of the total thought units reported. Table 24 contains evidence of a perceptible increase in awareness of, and concern for teaching techniques and strategies, and while no dramatic change occurred, this category accounts for a generally higher percentage of teacher thoughts in lessons 5 to 8 (post in-service (a)) and a consistently higher level in lessons 9 and 10 (post in-service (b)) than in the pre in-service lessons.

When the substantive components of this category (Table 26) are considered for Teacher 3, the single greatest proportion of interactive thoughts focus on teaching strategies. This subcategory contains an increasing proportion of the interactive thoughts after the in-service experience with the exception of lesson 5. This apparent aberration should be considered in the context of the lesson description in Appendix H.

Two components of this category in which change is apparent in the thinking of Teacher 3 are pupil selection and evaluation of strategies. Evidence of this change however does not appear immediately following the in-service experience but in subsequent lessons. In both cases, over the duration of the study these components display a general decrease in the percentage of thoughts coded in them. Pupil selection was an issue directly addressed in the in-service program.

With Teacher 6 a similarly high percentage of teacher thoughts were coded in this category (Table 25), varying from 10.4 percent to 30.4 percent, accounting for the highest percentage in all lessons except lesson 9. There is no evidence of systematic change with regard to the percentage of teacher thoughts coded in this category.

Table 27 reveals that for Teacher 6, as for Teacher 3, the majority of the thoughts in this category concerned teaching strategies. The percentage is both high and relatively constant for the ten lessons.

Over the other components in this category systematic and sustained change is not apparent in the thoughts of Teacher 6 although with regard to monitoring strategies in the post in-service (a) phase,

Table 26

Instructional Strategies - Methodology

Substantive Components Showing Percentage Distribution. Teacher Three

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Teaching Strategies	53.8	51.4	43.3	51.9	34.5	65.2	73.2	58.7	71.4	62.2
Pupil Selection	15.4	16.2	20.0	11.1	17.2	4.3	2.4		4.1	5.4
Planning			6.7		6.9		2.4	15.2	2.0	2.7
Alternative Strategies	3.8	2.7	6.7	11.1	3.4	2.2	4.9	2.2	4.1	2.7
Monitoring	11.5	13.5	6.7	22.2	17.2	13.0	14.6	8.7	12.2	8.1
Reinforcement				3.7	3.4					8.1
Motivation			3.3					6.5		
Evaluation of Strategies	15.4	16.2	13.3		17.2	15.2	2.4	8.7	6.1	10.8
n	26	37	30	27	29	46	41	46	49	37

Table 27

Instructional Strategies - Methodology

Substantive Components Showing Percentage Distribution. Teacher Six

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Teaching Strategies	64.7	45.0	75.0	50.0	38.6	76.0	67.9	68.0	66.7	58.3
Pupil Selection	5.9	1.7		5.0	2.3				8.3	
Planning		5.0		5.0	6.8	4.0	3.6			
Alternative Strategies	2.9	8.3	9.1	20.0	18.2	4.0	3.6	12.0		12.5
Monitoring	11.8	13.3			4.5		7.1	8.0	16.7	
Reinforcement	2.9							4.0		
Motivation										
Evaluation of Strategies	11.8	26.7	15.9	20.0	29.5	16.0	17.9	8.0	8.3	29.2
n	34	60	44	20	44	25	28	25	12	24

the percentage of teacher thoughts decreases. This trend is not maintained in the protocol of lesson 9 in which the highest percentage (16.7 percent) for this component is registered. This decrease in interactive thoughts related to monitoring in lessons 5 to 8 is paralleled by a significant decrease in the high inference ratings in both language arts and mathematics (Table 16) for teacher monitoring of seat work.

While representing generally lower percentages, reference to lesson planning by Teacher 6 was more frequent after the in-service program however this was not sustained in the post in-service (b) phase.

A significant component of the thoughts of Teacher 6 concerned evaluation of strategies, which, coupled with consideration of alternative strategies, accounted for a substantial proportion of thoughts in each lesson.

Substantive Components of Instructional Strategies - Classroom Management and Control

The stimulated recall protocols contained interative thoughts related to the organization, management and control of the learning environment. These thought units reflected concern over management, control and discipline and strategies designed to achieve these. For the period of the study this category accounted for approximately one-sixth of the interactive thoughts of both teachers (Tables 24 and 25).

Table 24 contains little evidence on which to infer systematic change in interactive thinking with regard to classroom management and control by Teacher 3 as a result of the in-service experience. Lesson 5, immediately following the in-service workshops, displays a marked increase in the percentage of thought units in this category, however this percentage was not maintained and is likely to reflect the situational variables of that lesson (Appendix H). In the post in-service (b) phase of the study the percentage of thoughts coded in this category displays a marked decrease.

Of the substantive components of this category, the highest percentages (Table 28) of thoughts reported by Teacher 3 pertain to that teacher's concern for the need for control and control strategies. The percentage of thought units related to the control strategies used in the lessons remained consistently high throughout the ten lessons, whereas after the in-service program awareness of and concern for the need for control occupied a reduced percentage of reported thoughts. This change is paralleled by more consistent reference to evaluation of control strategies subsequent to the in-service program.

Reference to management moves related to the teaching space or the lesson fluctuate widely for Teacher 3, ranging from 5.3 percent to 41.2 percent (Table 28) in the ten lessons. After the in-service experience a consistently higher percentage of the teacher's interactive thoughts centered on this element. Teaching Strategies 1 to 6 (Appendix A) addressed the issue of behavior management and classroom discipline.

Table 25 shows that of Teacher 6's interactive thoughts a relatively uniform proportion was related to the issues of classroom management and control. The slightly higher percentages in this category in the protocols of the stimulated recall interviews conducted prior to the in-service experience could reflect teacher consciousness of the presence of a coder and the researcher in the teaching area.

The substantive component of this category which accounted for

Table 28

Instructional Strategies - Classroom Management and Control

Substantive Components Showing Percentage Distribution. Teacher Three

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Organization of Class or Lesson	5.3	27.9	11.1	26.1	6.5	28.2	36.2	30.8	25.0	41.2
Control Strategies	52.6	23.3	40.7	34.8	56.5	35.9	27.7	34.6	58.3	29.4
Evaluation of Control Strategies		16.3	14.8		15.2	17.9	4.3	11.5		5.9
Reinforcement			7.4		2.2					
Concern for Need for Control	26.3	20.9	18.5	4.3	10.9	12.8	14.9	7.7	4.2	11.8
Time	15.8	11.6	7.4	34.8	8.7	5.1	17.0	15.4	12.5	11.8
n	19	43	27	23	46	39	47	26	24	17

Table 29

Instructional Strategies - Classroom Management and Control

Substantive Components Showing Percentage Distribution. Teacher Six

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Organization of Class or Lesson	37.5	28.8	18.5	55.6	32.0	7.1	14.3	50.0	12.5	13.3
Control Strategies	37.5	32.7	40.7		36.0	78.6	42.9		18.8	26.7
Evaluation of Control Strategies		5.8	3.7		4.0	14.3			6.3	6.7
Reinforcement										
Concern for Need for Control	6.3	13.5	7.4		8.0		21.4		37.5	33.3
Time	18.8	19.2	29.6	44.4	20.0		21.4	50.0	25.0	20.0
n	16	52	27	9	25	14	14	6	16	15

the most consistently high proportion of Teacher 6's interactive thoughts was control strategies (Table 29), where the teacher recalled thoughts related to the control strategies which were adopted. In the post in-service (b) phase of the study a lower proportion fell in this subcategory. This decrease paralleled a marked increase in thoughts reflecting concern for need for control. This apparent change in teacher thinking may be accounted for by the features of the specific lessons in question.

While marked variations are apparent, over the duration of the study a decreasing proportion of Teacher 6's interactive thoughts pertained to the organization of the classroom or of the lesson. A plateauing in the percentage of thoughts related to this component is apparent in lessons 9 and 10.

Thoughts concerning time, such as the amount of time an activity was taking, time remaining in a lesson, or time that could justifiably be spent in the pursuit of a pupil's interest represent a significant proportion of the thoughts of both teachers, but more notably for Teacher 6. This cognizance of time is reported further in the macro-analysis of the total protocols.

Substantive Components of Instructional Strategies - Lesson Content

Analysis of the stimulated recall protocols reveals teacher thoughts concerning the substance of the lesson; curriculum, materials and resources. Overall this category accounts for a small percentage of the interactive thoughts of both teachers (Tables 24 and 25).

For Teacher 3 the percentage of thoughts falling in this category decreased after the in-service experience and this situation was maintained in the post in-service (b) phase when interviews were conducted one month later. A similar trend is identifiable for Teacher 6.

Due to the small number of thought units in this category care must be exercised in interpreting the percentages presented in Tables 30 and 31 relevant to the individual components.

The major proportion of the thought units of both teachers related to lesson content addressed the issue of the curriculum or the substantive content of the specific lesson; what was being taught, its appropriateness and its relationship to other material. Of the components in this category this alone was contained in every protocol for each teacher. The proportion of teacher thoughts in this component remained consistently high for both teachers throughout the study and did not reflect impact by the in-service experience.

Substantive Components of Perceptions

For both teachers approximately one-eighth of their interactive thoughts reflected sensory awareness of such features of the learning environment as pupil verbal and non-verbal behavior, classroom noise, pupil workstate and consciousness of whether or not pupils were present in the classroom.

Table 24 shows that the percentage of Teacher 3's interactive thoughts involving perceptions remained generally unchanged during the course of the study although considerable variation occurred between lessons. For Teacher 6 (Table 25) an increasing proportion of thoughts was related to teacher perception. This trend, which is apparent prior to the in-service course, is sustained in both the post in-service (a)

Table 30

Instructional Strategies - Lesson Content

Substantive Components Showing Percentage Distribution. Teacher Three

	Pre In-service				Post In-service (a)				Post In- (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Curriculum/Content	72.7	50.0	45.5	36.4	100.0	30.0	33.3	77.8	80.0	100.0
Materials	18.2	50.0	9.1			10.0	22.2	11.1		
Resources			18.2	54.5			33.3		20.0	
Goal Statements/Intended Outcomes	9.1		27.3	9.1		60.0	11.1	11.1		
n	11	2	11	11	1	10	9	9	5	3

Table 31

Instructional Strategies - Lesson Content

Substantive Components Showing Percentage Distribution. Teacher Six

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Curriculum/Content	50.0	55.6	53.8	100.0	88.9	75.0	40.0	100.0	100.0	100.0
Materials	40.0	44.4	7.7		11.1	25.0	20.0			
Resources			30.8				10.0			
Goal Statements/Intended Outcomes	10.0		7.7				30.0			
n	10	9	13	4	9	4	10	1	3	2

and (b) phases of the study, suggesting an increasing awareness of the classroom milieu on the part of that teacher. Teaching Strategies 2, 6, and 24 (Appendix A) addressed the issue of teacher awareness of the classroom environment.

Tables 32 and 33 indicate that both teachers reported awareness of what the pupils were saying (their questions, comments and answers), and of pupil posture, movement and expressions. Overall, Teacher 6 (Table 33) attended more to aural cues (verbal behavior and classroom noise), while Teacher 3 (Table 32) more commonly reported thoughts related to visual stimuli, notably awareness of student movement and student work activity.

Tables 32 and 33 contain little evidence of systematic change with regard to the components to which the teachers attended with the exception that Teacher 6 (Table 33) recalled a higher percentage of thoughts related to classroom noise in the post in-service (b) phase, that is, one month after the in-service experience.

Both teachers reported perception of non-learning related cues such as interruptions, pupil dress and weather.

Substantive Components of Interpretations

Thought units in which the teachers attributed meaning or explanation to their perceptions were termed Interpretations. Over the ten lessons such inferences accounted for 17.4 percent of the interactive thoughts recalled by Teacher 3 (Table 24) and while variations between lessons occurred within this category there is no evidence of systematic or sustained change. Table 25 indicates that this category accounted for 13 percent of Teacher 6's interactive

Table 32

Perceptions

Substantive Components Showing Percentage Distribution. Teacher Three

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Pupil Verbal Behavior	54.5	21.4	10.0	11.1	25.0	16.7	8.3	13.0	27.3	21.7
Pupil Non-verbal Behavior	18.2	11.9	35.0	61.1	37.5	36.1	19.4	30.4	13.6	30.4
Pupil Work Activity	9.1	33.3	45.0	11.1	6.3	25.0	11.1	39.1	18.2	
Pupil Physical Presence	9.1	11.9		11.1		11.1	22.2	4.3	13.6	30.4
Classroom Noise		14.3	10.0		12.5	11.1	8.3	4.3	9.1	8.7
Miscellaneous	9.1	7.1		5.5	18.8		30.6	8.7	18.2	8.7
n	11	42	20	18	16	36	36	23	22	23

Table 33

Perceptions

Substantive Components Showing Percentage Distribution. Teacher Six

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Pupil Verbal Behavior	44.4	31.8	50.0	33.3	35.7	20.0	43.7	42.9	25.0	25.0
Pupil Non-verbal Behavior	22.2	9.1	21.4	44.4	14.3	26.7	18.8		16.7	25.0
Pupil Work Activity	11.1	18.2	7.1		10.7	13.3	6.3		12.5	16.7
Pupil Physical Presence		9.1	7.1	22.2	14.3	13.3		14.3	4.2	
Classroom Noise	11.1	22.7	7.1		3.6		18.8		25.0	33.3
Miscellaneous	11.1	9.1	7.1		21.4	26.7	12.5	42.9	16.7	
n	9	22	14	9	28	15	16	7	24	12

thoughts, with a discernible increase occurring over the duration of the study. This change could not be attributed to the in-service program in so far as the trend was apparent prior to that event.

Analysis of the substantive components of this category reveals that Teacher 3 (Table 34) primarily made inferences concerning pupils' academic performance, their motivational state, their cognitive processes and their feelings. The uniformly high level of reference to pupil attention/motivation could reflect the previously discussed concern for management and control. Interpretations concerning the intellectual functioning of the pupils remained consistently high.

Although inferences regarding pupil feelings were frequently recalled by Teacher 3 the data represented in Table 34 suggest that a decrease occurred immediately following the in-service program, only to be reversed in the stimulated recall sessions conducted one month later. Reference to the high inference data recorded in Table 16 reveals that on "warmth" (Teaching Strategy 25) Teacher 3's ratings increased slightly, but on "empathy" (Teaching Strategy 26) in language arts there was an initial drop and in mathematics an initial rise followed in both subject areas by a significant increase between the post in-service (a) and (b) phases.

While the inferences contained in the interactive thoughts of Teacher 6 focused in areas similar to those reported for Teacher 3, a significantly higher proportion were related to the cognitive functioning of the pupils (Table 35).

The frequency of interactive thoughts of Teacher 6 concerning interpretations of pupil feelings does not reflect the empathatic nature of the teacher evident from the macro-analysis which addressed all

Table 34

Interpretations

Substantive Components Showing Percentage Distribution. Teacher Three

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Academic Performance	37.0	17.4	31.3	27.3	16.7	23.5	8.3	25.7		9.4
Attention/Motivation	11.1	41.3	6.2	18.2	50.0	17.6	19.4	40.0	23.5	28.1
Pupil Movement		6.5			5.6	29.4	5.6		5.9	18.8
Verbal Behavior	3.7	6.5	6.2							
Cognitive Processes	22.2	19.6	12.5	36.4	11.1	5.9	41.7	25.7	44.1	25.0
Pupil Feelings	11.1	6.5	43.8	15.2	5.6	5.9	13.9	5.7	17.6	15.6
Pupil Needs						5.9	2.8			
Miscellaneous	14.8	2.2		3.0	11.1	11.8	8.3	2.9	8.8	3.1
n	27	46	16	33	18	17	36	35	34	32

Table 35

Interpretations

Substantive Components Showing Percentage Distribution. Teacher Six

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Academic Performance	12.5	40.0	10.5	40.0	25.0	12.5	20.0	42.9	5.0	15.0
Attention/Motivation		10.0	5.3	20.0	5.0	20.8	10.0		25.0	5.0
Pupil Movement			10.5							
Verbal Behavior										
Cognitive Processes	75.0	20.0	63.2	30.0	30.0	33.3	30.0	35.7	50.0	50.0
Pupil Feelings	12.5	25.0			10.0	16.7	20.0	14.3	10.0	20.0
Pupil Needs										
Miscellaneous		5.0	10.5	10.0	30.0	16.7	20.0	7.1	10.0	10.0
n	8	20	19	10	20	24	10	14	20	20

thoughts recorded in the stimulated recall protocols.

There is no evidence in Table 35 from which to infer that Teacher 6's interpretive thoughts concerning the substantive components of this category varied systematically during the course of the study.

Substantive Components of Pupil Information

Analysis of the stimulated recall protocols reveals that both teachers used pre-lesson information about pupils as part of their information processing and as a basis for interaction.

Tables 24 and 25 indicate that both teachers reported approximately 10 percent of their interactive thoughts related to pupil information which the teacher had taken into the interactive situation. While marked variations are apparent between lessons, for both teachers a general stability is evident in the proportion of interactive thoughts concerning pupil information over the major phases of the study.

Analysis of this category into its substantive components reveals the wide range of information that the teachers recalled interactively and used as a context for their interaction with pupils (Tables 36 and 37).

Teacher 3 principally recalled information related to pupil personality, previous academic performance, classroom behavior and general information such as pupil interest and punctuality. Of these, knowledge of academic performance was most frequently recalled and this frequency showed a marked increase following the in-service experience (Table 36). More consistent reference was also made to pupil personality after the in-service program.

The component most consistently addressed in the information

Table 36

Pupil Information

Substantive Components Showing Percentage Distribution. Teacher Three

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Personality	10.0	20.0			11.1	26.7	17.6	11.8	3.2	8.3
Academic Ability	20.0			5.9		3.3	5.9			16.6
Academic Performance		45.0		23.5	11.1	40.0	29.4	35.3	25.8	16.6
Classroom Behavior	10.0	15.0	50.0	41.2	66.7	13.3	17.6	17.6	35.5	25.0
Social Behavior			50.0	5.9			5.9			
Physical Characteristics	10.0						5.9			
Knowledge Possessed by Pupil	10.0						5.9	5.9		
Expectations for Pupil	20.0	15.0				3.3		23.5	19.4	16.6
General Information	20.0	5.0		23.5	11.1	13.3	11.8	5.9	16.1	16.6
n	10	20	2	17	9	30	17	17	31	12

Table 37

Pupil Information

Substantive Components Showing Percentage Distribution. Teacher Six

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Personality	15.4	3.8	12.5		12.5	25.0	14.3			
Academic Ability	23.1	15.4	25.0		6.3		14.3	10.0		20.0
Academic Performance	46.2	11.5	31.3		18.8		28.6	30.0	33.3	40.0
Classroom Behavior		15.4			6.3	25.0	14.3	20.0	22.2	
Social Behavior										
Physical Characteristics										
Knowledge Possessed by Pupil		11.5		50.0	6.3					
Expectations for Pupil	15.4	15.4			25.0		28.6			40.0
General Information		26.9	31.3	50.0	25.0	50.0		40.0	44.4	
n	13	26	16	4	16	8	7	10	9	5

recalled about the pupils concerned classroom behavior which probably reflects previous discussion related to Teacher 3's concern regarding management and control. This will be amplified further in the macro-analysis of the total protocols.

Teacher 6 most frequently integrated general information about the pupils into the interactive situation and reference was consistently made to past academic performance (Table 37).

Although the frequencies involved are low there is evidence in Table 37 to suggest that Teacher 6 took greater cognizance of pupil's previous classroom behavior after the in-service program. Interactive reference to academic ability decreased after the in-service experience.

The significance of interactive thoughts related to pupil information is supported by the prevalent reference to case histories in the macro-analysis of both interactive and non-interactive thoughts contained in the protocols.

Feelings

Thought units in which the teachers reported emotions or reactions experienced in the interactive situation were categorized as feelings. In presenting this data cognizance is taken of Marland's (1977) claim that mention of an emotion often indicates a pervasive condition, unlike other thoughts which endure only fleetingly in the consciousness of the teacher. Because of this, Marland (1977:109) claims "probably much less importance should be attached to the frequency of feelings than frequencies in any other thought category." For the purpose of this study Marland's caution will be noted and the frequencies presented in Tables 24, 25, 38 and 39 interpreted broadly.

From Tables 24 and 25 it is evident that feelings were reported as being experienced in every lesson by each teacher, representing a relatively consistent proportion of the reported thought units in the lessons. Overall, the proportion of thoughts reflecting feelings reported by Teacher 6 was almost twice that of Teacher 3. This may reflect the differing personalities, the different teaching situations they confronted or the degree to which Teacher 3 internalized the phenomenon of Suppressing Emotions, a feature to be discussed in a subsequent section.

Both teachers used a large number of descriptors in recounting their affective states and these descriptive terms have been grouped according to similarities and presented in Tables 38 and 39. Teacher 3 most frequently and consistently recalled experiencing feelings of anxiety and pleasure, while also mentioning feelings of frustration, surprise, humor, unconcern and indifference. From Table 38 it would appear that a generally higher level of anxiety was experienced after the in-service program.

Teacher 6 recalled interactive feelings embracing a similar range of emotions, however, significantly more frequent and consistent reference was made to feelings of frustration. In three lessons this teacher also recalled feelings of guilt (Table 39).

By way of description, the objects of the teacher's feelings are presented in Tables 40 to 43. Table 40 shows that the anxiety experienced by Teacher 3 was generated principally through concern for teaching strategies. The frustration reported by Teacher 6 centered on classroom control and pupil behavior, teaching strategies and learning behavior (Table 41).

Tables 42 and 43 show the feelings associated with the various

Table 38

Feelings

Percentage Distribution of Teacher's Feelings. Teacher Three

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Anxiety	66.7	18.2		33.3	25.0	28.6	26.3	41.7	42.9	50.0
Frustration		36.4				7.1	15.8	33.3		8.3
Pleasure	11.1	36.4	50.0	33.3	25.0	28.6	31.6		14.3	33.3
Surprise		9.1	16.7		25.0	14.3	21.1	16.7	14.3	8.3
Guilt										
Humor	11.1		33.3			7.1				
Unconcern	11.1			33.3	25.0	14.3			14.3	
Indifference							5.3	8.3	14.3	
n	9	11	6	3	4	14	19	12	7	12

Table 39

Feelings

Percentage Distribution of Teacher's Feelings. Teacher Six

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Anxiety		17.6	7.7	12.5	4.5		14.3	20.0	14.3	25.0
Frustration	30.8	70.6	30.8	50.0	13.6	50.0	28.6	20.0	57.1	37.5
Pleasure	30.8		23.1	12.5	31.8	20.0		40.0	14.3	25.0
Surprise	30.8	5.9	7.7	12.5	18.2	10.0	28.6			
Guilt					13.6	10.0			4.8	
Humor			15.4	12.5			7.1		4.8	
Unconcern			7.7		13.6	10.0	7.1	20.0	4.8	12.5
Indifference	7.7	5.9	7.7		4.5		14.3			
n	13	17	13	8	22	10	14	5	21	8

Table 40

Teacher Feelings Expressed as a Percentage
of the Objects of those Feelings. Teacher Three

	Anxiety	Frustration	Pleasure	Surprise	Guilt	Humor	Unconcern	Indifference
Control, pupil behavior	14.7	84.6	28.0	30.8				100.0
Progress of lesson	8.8							
Interruptions				7.7			16.7	
Teaching strategy	35.3		4.0	15.4				
Classroom management	14.7	7.7	4.0				33.3	
Learning behavior; questions, responses, standard of work	11.8	7.7	48.0	46.2		50.0	33.3	
Content, materials resources	2.9		8.0			50.0		
Individual pupils								
Presence or lateness of pupils	5.9		8.0					
Non-task-related issues	5.9						16.7	
Total	100.0	100.0	100.0	100.1	0.0	100.0	100.0	100.0

Table 41

Teacher Feelings Expressed as a Percentage of the Objects of those Feelings. Teacher Six

	Anxiety	Frustration	Pleasure	Surprise	Guilt	Humor	Unconcern	Indifference
Control, pupil behavior	26.6	22.6	20.0				16.7	
Progress of lesson	20.0	7.5		13.3	25.0		16.7	
Interruptions		3.8			25.0		8.3	
Teaching strategy	13.3	18.9	12.0		50.0	33.3	8.3	
Classroom management		5.7		6.7				
Learning behavior, questions, responses, standard of work	20.0	24.5	48.0	60.0		33.3	33.3	50.0
Content, materials resources			8.0	13.3				
Individual pupils	6.7	9.4	8.0			16.7	16.7	50.0
Presence or lateness of pupil								
Non-task-related issues	13.3	7.5	4.0	6.7		16.7		
Total	99.9	99.9	100.0	100.0	100.0	100.0	100.0	100.0

Table 42

Objects of Teacher Feeling Expressed in Terms of Feelings Generated. Teacher Three

	Anxiety	Frustration	Pleasure	Surprise	Guilt	Humor	Unconcern	Indifference	Total
Control, pupil behavior	16.7	36.7	23.3	13.3				10.0	100.0
Progress of lesson	100.0								100.0
Interruptions				50.0			50.0		100.0
Teaching strategy	80.0		6.7	13.3					100.0
Classroom management	55.6	11.1	11.1				22.2		100.0
Learning behavior, questions, responses, standard of work	15.4	3.8	46.2	23.1		3.8	7.7		100.0
Content, materials resources	25.0		50.0			25.0			100.0
Individual pupils									
Presence or lateness of pupil	50.0		50.0						100.0
Non-task-related issues	66.7						33.3		100.0

Note: All figures in this table are percentages.

Table 43

Objects of Teacher Feeling Expressed in
Terms of Feelings Generated. Teacher Six

	Anxiety	Frustration	Pleasure	Surprise	Guilt	Humor	Unconcern	Indifference	Total
Control, pupil behavior	17.4	52.2	21.7				8.7		100.0
Progress of lesson	25.0	33.3		16.7	8.3		16.7		100.0
Interruptions		50.0			25.0		25.0		100.0
Teaching strategy	10.0	50.0	15.0		10.0	10.0	5.0		100.0
Classroom management		75.0		25.0					100.0
Learning behavior, questions, responses standard of work	6.8	29.5	27.3	20.5		4.5	9.1	2.3	100.0
Content, materials resources			50.0	50.0					100.0
Individual pupils	8.3	41.7	16.7			8.3	16.7	8.3	100.0
Presence or lateness of pupil									
Non-task-related issues	22.2	44.4	11.1	11.1		11.1			99.9

Note: All figures in this table are percentages.

objects of those feelings. Of the feelings reported by Teacher 3 concerning classroom control, 36.7 percent was frustration, 23.3 percent pleasure, 16.7 percent anxiety, 13.3 percent surprise and 10 percent indifference. For Teacher 6 the feelings experienced for the same object were 52.2 percent frustration, 21.7 percent pleasure, 17.4 percent anxiety and 8.7 percent unconcern.

Substantive Components of Self Awareness

Examination of the protocols reveals evidence of interactive thought which indicates teacher awareness of himself and his behavior in the learning environment. Such thoughts account overall for a relatively small, although constant percentage of the total thought units recorded by both teachers.

Data in Table 24 suggest that over the ten lessons comprising the study Teacher 3 reported a decreasing proportion of thoughts centering on himself and his classroom performance. For three lessons however an unusually high percentage of thoughts fell in this category. In lesson 3 this higher percentage of thought units reflecting self awareness arose from repeated reference to personal teaching style and concern over speech patterns. Similarly, in lesson 6 Teacher 3 was evaluating his own performance, expressing concern over the errors he was conscious of making. In lesson 5 the teacher was critical of his handling of disruption.

> T3.5: I obviously wasn't doing something right . . . . I felt I hadn't achieved anything throughout the morning.

Teacher 6 reported a slightly higher proportion of thoughts in this category and Table 25 indicates an increase in this teacher's self awareness in the lessons immediately following the in-service program although self awareness in lessons 9 and 10 was at the pre in-service level. The lesson descriptions contained in Appendix H suggest that this increase is due more to lesson-specific issues than the impact of the in-service course. That this increase might be attributable to self confrontation as a consequence of stimulated recall will be discussed in a later section.

Tables 44 and 45 reveal that of the substantive components of this category both teachers primarily reported interactive thoughts which indicated reflection on and judgment of their own classroom performance. This included awareness of instructional strategies. Teacher 6 reported interactive thoughts in the instructional evaluation component with greater frequency in the post in-service (a) phase of the study. Reference to Appendix H will reveal details particularly of lesson 5 and 8 which explain some of the self awareness related to teacher performance.

Both teachers reported awareness of personal characteristics such as personality, appearance and teaching style, and awareness of themselves in the teaching space. Interactive thoughts concerning personal preparation were reported by Teacher 6 in six of the ten protocols with heightened awareness of this issue being evident in the lessons immediately following the in-service experience. Teaching Strategies 13 and 14 (Appendix A) of the in-service program focused upon the issues of pre-planning and the need for instructional variation.

This issue of self awareness, which has been identified in the interactive thoughts of the teachers assumes richer significance when set in the larger context of the phenomenon Teacher Self Monitoring which was identified through macro-analysis of the total thoughts

Table 44

Self Awareness

Substantive Components Showing Percentage Distribution. Teacher Three

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Instructional Evaluation	83.3	85.7	25.0	100.0	40.0	91.7	66.7	100.0	100.0	50.0
Personal Reflection			66.7		20.0	8.3	33.3			
Personal Preparation			8.3							
Awareness of Position in Room	16.7	14.3			40.0					50.0
n	6	7	12	5	10	12	3	2	4	2

Table 45

Self Awareness

Substantive Components Showing Percentage Distribution. Teacher Six

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Instructional Evaluation	40.0	37.5	50.0	100.0	71.4	27.3	66.7	58.3	40.0	100.0
Personal Reflection		62.5	50.0		21.4	27.3		16.7		
Personal Preparation	60.0				7.1	36.4	33.3	25.0	60.0	
Awareness of Position in Room						9.1				
n	5	8	2	3	14	11	6	12	5	1

contained in the protocols and which is presented in a subsequent section.

Substantive Components of Beliefs

A small proportion of the interactive thoughts of both of the teachers reflected their pedagogical and general beliefs.

Beliefs were expressed in every protocol by Teacher 3 (Table 24) but only in five of the protocols by Teacher 6 (Table 25). The data in these tables do not contain evidence of systematic change in the frequency with which the teachers recalled interactive reference to beliefs over the phases of the study. This category accounted for the smallest percentage of the interactive thoughts reported by Teacher 6.

Tables 46 and 47 show that of the beliefs expressed, the major proportion was related to general pedagogical issues such as reinforcement, individual differences, pupil selection, teaching strategies, discipline, and principles involved in the learning process.

These beliefs were expressed in everyday terms and displayed the absence of technical vocabulary identified by Jackson (1968) as characterizing teacher talk. A selection of these statements is contained in Appendix I.

The frequency with which beliefs were reported in the stimulated recall sessions does not indicate any impact on this aspect of teacher thoughts by the in-service program.

Substantive Components of Non-Task-Related Thoughts

Interactive thoughts which were unrelated to the events of the lessons, the lesson content, instructional strategies, the learning

Table 46

Beliefs

Substantive Components Showing Percentage Distribution. Teacher Three

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
General Pedagogical	44.4	87.5	100.0	90.9	100.0	100.0	100.0	100.0	100.0	100.0
Others	55.6	12.5		9.1						
n	9	8	1	11	5	4	6	2	5	3

Table 47

Beliefs

Substantive Components Showing Percentage Distribution. Teacher Six

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
General Pedagogical	66.7	100.0				100.0		100.0	100.0	
Others	33.3									
n	3	1	0	0	0	2	0	1	4	0

environment or the people within it were reported by both teachers. This category accounted overall for only 1 percent of the interactive thoughts of Teacher 3 (Table 24) while representing 3.9 percent of the thoughts of Teacher 6 (Table 25).

Although the frequency with which non-task-related thoughts were reported in the stimulated recall interviews was relatively low, three substantive components were identifiable; investigator awareness, which embraced thoughts concerning the researcher, the coder or the videotaping equipment, thoughts relating to classroom interruptions, and thoughts about general non-concurrent events. Table 48 reveals that Teacher 3's non-task-related thoughts most commonly involved investigator awareness and occurred in the early lessons of the study. These thoughts often centered on the teacher's concern over whether the researcher could hear student responses.

Teacher 6 reported non-task-related thoughts three times as frequently as Teacher 3. Of these, general non-concurrent events represented 48 percent and investigator awareness 40 percent. From Table 49 it is evident that non-task-related thoughts occurred with ususually high frequency in lessons 2 and 5. In protocol 2 the teacher reported interactive thoughts concerning his interest in the investigator's response to the ongoing lesson and his strategies and how these would appear on videotape. During the lesson discussion also arose regarding an out-of-school sporting fixture in which the teacher was involved. This was the subject of non-task-related thought. In lesson 5 the non-task-related thoughts were centered on general issues related to a sporting telecast viewed the previous evening and a legal document which the teacher feared had been misplaced.

Table 48

Non-Task-Related Thoughts

Substantive Components Showing Percentage Distribution. Teacher Three

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Investigator Awareness	100.0	66.7	100.0			100.0	100.0			100.0
Interruptions		33.3							100.0	
General					100.0					
n	3	3	2	0	3	1	1	0	3	1

Table 49

Non-Task-Related Thoughts

Substantive Components Showing Percentage Distribution. Teacher Six

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
Investigator Awareness	100.0	57.1	20.0		25.0	40.0	100.0		100.0	100.0
Interruptions			60.0			60.0				
General		42.9	20.0	100.0	75.0			100.0		
n	1	14	5	2	16	5	1	3	2	1

MACRO-ANALYSIS OF TEACHER THOUGHTS

A second level of analysis in this study consisted of a macro-analysis of all of the data contained in the stimulated recall protocols. This was undertaken with the objectives of:

1. identifying and describing phenomena which appear to comprise elements or characteristics of the educational philosophies of the two teachers and which exert a mediating influence on teacher classroom behavior;
2. tracing reference to these phenomena over the course of the study in order to identify change or evidence of stability within the underlying educational philosophies. This information could provide supplementary or supportive evidence for the findings based upon analysis of teacher process data and analysis of teacher interactive thoughts.

The phenomena identified in the interactive and non-interactive data contained in the stimulated recall protocols are summarized in Tables 50 and 51 which show the frequency of occurrence of each phenomenon in the protocols.

Familiarity with the data and knowledge of the context of the stimulated recall sessions leads to a caution regarding interpretation of the frequencies shown in Tables 50 to 56. There is evidence to suggest that the teachers did not treat the stimulated recall sessions as discrete interviews but rather as ongoing discussion. This is exemplified by such comments as:

T3.5: It's the same boy as I have discussed previously.

T3.7: . . . I think I told you yesterday that the day before Peter had mentioned that . . . .

I: Why did you choose Barry?
T6.3: Same reason as the other day.

T6.8: This goes back to - remember I was telling you they were starting to make note of my mistakes . . . .

T6.8: Like I was mentioning to you before in one of these situations . . . .

This tendency may have served to impact the reporting of non-interactive data, for lack of reference to a phenomenon in a subsequent stimulated recall session may reflect a reluctance by the teacher to repeat or restate thoughts similar to those expressed in an earlier session on the grounds that it was redundant. This may apply particularly to the articulation of a philosophical stance or belief with respect of an issue. With regard to interactive thoughts, this similar reluctance may be expressed in a passing of stimulus points similar to those which have already stimulated the recall of interactive thoughts.

For these reasons it is contended that at best the frequencies in Tables 50 to 56 represent a rather gross measure of teacher thoughts in reference to the phenomena and that care should be exercised in interpreting absolute frequencies,

Despite this caution frequent reference to a phenomenon no doubt indicates the significance of that phenomenon within the thought process of the teacher, however consistency of reference is more likely to indicate the degree to which a phenomenon pervades teacher thinking.

The macro-analysis, which reflects all of the teacher thoughts contained in the stimulated recall interviews, is perceived to provide valuable insight into the underlying educational philosophies of the teachers. For this reason the data will not only be analyzed for phenomena and evidence of change, but the phenomena will be described fully in order to provide a context within which to interpret teacher process data and interactive thoughts.

Phenomena

1. Teacher Monitoring

A feature of the stimulated recall protocols was a pervasive awareness by the teachers of features and conditions prevailing in the learning environment, a monitoring of instructional strategies, and a constant state of alert for evidence of disturbance, learning difficulty or off-task activity. Such comments as,

> T3.3: I was conscious of them. If they were not too distracting to us I guess I didn't look at them as often . . . .
>
> T3.4: I was just checking, you know to see how they're doing and I know I was aware that Michael was walking around, but I didn't say anything because he wasn't disturbing anyone.
>
> T3.10: There's a glare if you're sitting at a certain angle so I thought I'd better pull the blind.
>
> T6.1: I wanted to make sure everyone had it done . . . I was just checking them there.
>
> I: Were you aware of that boy coming in late?
> T6.6: Yes, I knew what he was doing so I just mentally ticked him off.
>
> T6.7: Just generally watching and observing.
>
> T6.7: I do look around the room even when someone is giving a response to see what attention is like; to read the signs.

provide evidence of this constant, general level of awareness and monitoring.

Specific aspects of the classroom milieu which were the focus of this overall monitoring behavior by the two teachers in the study are

Table 50

SUMMARY OF MACRO-ANALYSIS OF PROTOCOLS

Frequencies with which Phenomena Occurred in
the Stimulated Recall Protocols - Teacher Three

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
1. Teacher Monitoring										
i Ecological factors	3	6	3	6	4	1	8	6	4	3
ii Instructional strategies	5	6	3	3	4	5	4	4	4	3
iii Classroom management & control	5	29	14	6	25	14	22	18	13	8
iv Self monitoring	6	9	6	1	6	2	2	5	5	-
Total	19	50	26	16	39	22	36	33	26	14
2. Equality of Treatment	6	6	6	4	1	5	1	1	2	3
3. Teacher Authenticity	1	2	-	1	-	-	-	1	-	1
4. Teacher Empathy	4	3	4	2	2	-	-	1	-	1
5. Suppressing Emotions	-	4	1	-	-	2	-	-	1	-
6. Cognitive Linking	3	3	3	5	-	6	3	4	4	2
7. Rules	-	1	1	1	6	1	1	3	-	3
8. Beliefs	3	7	5	4	5	3	4	2	6	1
9. Case Histories	3	6	5	5	4	5	2	3	5	4
Total	39	82	51	38	57	44	47	48	44	29

Table 51

SUMMARY OF MACRO-ANALYSIS OF PROTOCOLS

Frequencies with which Phenomena Occurred in
the Stimulated Recall Protocols - Teacher Six

	Pre In-service				Post In-service (a)				Post In-s (b)	
Lesson	1	2	3	4	5	6	7	8	9	10
1. Teacher Monitoring										
i Ecological factors	3	4	9	2	4	5	7	2	1	3
ii Instructional strategies	3	6	3	3	5	2	2	1	-	4
iii Classroom management & control	4	8	10	2	9	8	10	1	10	8
iv Self monitoring	2	8	6	1	9	10	4	6	2	1
Total	12	26	28	8	27	25	23	10	13	16
2. Equality of Treatment	9	4	1	1	3	5	2	4	3	2
3. Teacher Authenticity	-	1	3	-	2	1	-	3	1	-
4. Teacher Empathy	1	1	4	2	2	5	3	1	2	2
5. Suppressing Emotions	1	3	1	-	3	1	-	-	3	-
6. Cognitive Linking	2	6	5	1	1	-	2	1	1	1
7. Rules	1	1	3	1	-	5	1	-	1	-
8. Beliefs	1	1	1	-	1	3	-	-	2	-
9. Case Histories	4	5	3	-	4	3	2	5	2	3
Total	31	48	49	13	43	48	33	24	28	24

identified below.

i. Ecological factors. Ecological factors refer to conditions and characteristics of the environment of which the teachers were aware and which they had to accommodate in their thinking. Those attended to were time, group size, classroom elements and interruptions.

(a) Time: Table 52 indicates that reference was made to an aspect of time in every lesson except lessons 3.6 and 3.8, and that multiple reference was made in several lessons, notably 6.3 and 6.7. The protocols reveal that in monitoring time the teachers addressed such facets as stage of the year;

> T6.3: At the first part of the year I used to make a point of checking a little more regularly . . . . At this time I feel that has been emphasized enough.

time in the week;

> T3.7: . . . and I think that perhaps because it is later on in the week they are a little more restless.

and segment in the lesson. With Teacher 3 this was commonly reflected in concern at the commencement of the lesson:

> T3.1: I thought I'd start sooner than that.
>
> T3.8: . . . I thought it's time for them to ask questions before I leave them.
>
> T3.10: I thought I'd wait a little more and then I'm just going to go on.

In planning lessons the teachers appear to conceptualize a time framework within which to operate and against which they gauged the progress of the lessons.

> T3.1: He went on and on and I was wondering about the time element. I thought we were running behind time.
>
> T3.5: I thought too much time was being spent on the lesson and it wasn't moving quickly enough.

Table 52

Teacher Monitoring: Ecological Factors

Substantive Components Showing Frequency of Distribution

	Teacher 3											Teacher 6										
	Pre In-service				Post In-service (a)				Post In-service (b)		Total	Pre In-service				Post In-service (a)				Post In-service (b)		Total
Lesson	1	2	3	4	5	6	7	8	9	10		1	2	3	4	5	6	7	8	9	10	
1. Teacher Monitoring																						
1 Ecological factors																						
a) Time	1	2	1	1	2		1		1	2	11	2	2	5	2	2	1	5	2	1	3	25
b) Group size		1	1		1			1			4											0
c) Interruptions	1	2			1	1	1	2	1		9			1			1					2
d) Classroom elements	1	1	1	5			6	3	2	1	20	1	2	3		2	3	2				13
Total	3	6	3	6	4	1	8	6	4	3	44	3	4	9	2	4	5	7	2	1	3	40

T6.2: I remember I was thinking that the correcting was taking a bit longer than I had anticipated.

Cognizance of, and concern for time impacted teaching strategies and classroom behavior.

T3.4: I know that children need to manipulate materials but I thought it would be faster if I did the demonstration myself in order to save time. I think we are getting a little behind in our program and I was concerned about the time element.

T6.2: . . . as I was walking away I was wondering as to what further I should have done, what further could I have done and did I want to take the time to do it.

T6.10: I was concerned a little bit in that if I didn't get the answer pretty soon I would have to give it.

Similarly, response to students was influenced by teacher awareness of time.

T3.3: I think he just had his words mixed up and I thought I'd talk to him individually instead of taking time now.

T6.3: If I had all the blocks and if I had the time I might have done it but I decided I've only got this much time - I'll just have to leave it [the problem] with her.

T6.9: She said we had answered her question but I wasn't too satisfied, but I also felt we'd taken enough time on it.

The rapidity and immediacy of classroom interaction noted by Jackson (1968) was reflected in the pressure experienced by Teacher 6 who, dissatisfied with a definition which had been written on the blackboard, but unable to think of how to alter it, reported:

T6.7: I didn't [change it] because I didn't think. I suppose if I'd had time to think about it I might have changed it. But I didn't because we had to go on to the next one.

An aspect of the teachers' orientation to a constant monitoring of the elements of their environment was awareness of time. In all, time was alluded to on thirty eight occasions in the twenty protocols; twenty five times by Teacher 6, who in one lesson stated:

> T6.7: I was thinking as to what would happen next, what I was covering or what I had to cover in the time remaining; sort of measuring my time generally.

Both teachers were aware of the impact of time on the learning environment, and concern about time impinged directly on teacher thoughts.

On the basis of the data in Table 52 there are no grounds for inferring that the teachers changed during the study with regard to awareness and monitoring of time.

(b) Group Size: Consciousness of this aspect of the learning environment impinged on the thinking of Teacher 3 and was reported in four different lessons. The teacher expressed concern for attendance and was aware of those who were missing:

> T3.2: . . . because it's a large group . . . and you'll always have to see that they catch up on what they've missed and it's demanding.

The same teacher implied that teaching strategies and the opportunity to individualize work are affected by class size:

> T3.3: Well I've given exercises to take home and practice. It's difficult to often give individual attention at school time with a large class like this.

Teacher response to, and interaction with pupils was influenced by awareness of the size of the group.

> T3.5: Well I thought I should try and use every opportunity I can to praise a child or reinforce him for some work he's done because it might be the only opportunity during the day that I'll hear him speak. It's such a large class.

Lack of prominence given to this variable by Teacher 6 is possibly attributable to the fact that the class comprised twenty seven pupils accommodated in a double open area teaching space.

Reference to Table 52 indicates that teacher concern for group size is unrelated to the phase of the study.

(c) Interruptions: Interruptions of an administrative nature, in the form of public address announcements and visitors, intruded into the classroom setting and impinged upon teacher interactive behavior. Teacher 3 reported a reaction to such interruptions in seven of the ten stimulated recall sessions, whereas Teacher 6 registered a response in only two lessons. Teacher reaction varied from annoyance at disruption of a lesson;

> I: Can you remember your reaction to the interruption?
> T6.6: Yes, annoyed at it.
> I: Why?
> T: Just because we were in a discussion here. It was fairly good, so it was interfering. Also from what I gathered it was going to be fairly lengthy . . . . I was also annoyed at my lack of preparation [of the announcement] . . . . I knew there were going to be a lot of questions arising out of it.

through indifference or acceptance of it as routine;

> T3.9: I knew I was going to lose the continuity of that problem and that I'd have to start again.
> I: Did that cause a reaction or feeling?
> T: I was waiting for the announcement I believe. I was wondering when it would come.

> T3.1: I wasn't bothered by the interruption because we have announcements quite often.

to welcoming the respite from classroom routine:

> T6.3: Some ways I sort of look forward to them because it means some new information or something is happening or something is going on in the office and I don't mind finding out what's going on.

There is no evidence in Table 52 to imply that teacher thoughts regarding interruptions changed over the period of the study.

(d) Classroom Elements: These comprise classroom displays, equipment, teaching aids and resources. Table 52 reveals that reference was made in the thoughts of the teachers to such classroom elements in eight protocols by Teacher 3 and six protocols by Teacher 6, with Teacher 3 making almost twice as many references in total as Teacher 6. This perhaps reflects the relative use of instructional materials (Tables 7 and 8) by the respective teachers. The reported thoughts indicate that the teachers were aware of these elements in the classroom setting, monitoring both their own and students' reaction to them. These classroom elements were perceived as facilitating teaching and learning functions.

> T3.2: I like to use the overhead to focus attention on one thing . . . .
>
> T6.3: I thought it was worthwhile enough [a concrete model] . . . beside having the picture in the book here they've got a real thing that they could look at . . . .

Teacher 3's comment that,

> T3.3: When doing the transparencies I know it would have been better if they would have been using some types of materials; but I thought I was saving time . . . .

reflects that these elements constitute part of deliberately planned teaching strategies but also that their use can represent a source of conflict for the teacher.

A dysfunctional element appeared in their use. Teacher 3 verbalized awareness of, and concern over, her own use of the blackboard:

> T3.1: . . . I should have started writing higher on the board, I didn't think they would have that many questions . . . I should have started at the top so I had more space.
>
> T3.7: I was concerned with the space at the board and the flannelboard. That's what I was really concerned about throughout my whole lesson.
>
> T3.7: I was thinking about space, that I needed somewhere to do the rest of my lesson.

Teacher 6 reports his concern while using a math model:

> T6.3: I was thinking that it was a little small . . . . It turned out well for the people on this side of the room but not for the others.

Both teachers reported thoughts centering on the resources used in their lessons:

> T6.6: . . . at first I didn't care for it [language arts text] at all. I still don't care for it in the way it is being used but it's a very good booklet for a high level group.

When displaying a picture with the objective of stimulating discussion and written work Teacher 6 reported the thoughts and reaction as follows:

> T6.7: I was wondering as to what the reaction was going to be. I was also thinking that I did not want to crush the picture too much . . . . The reaction I got from the Grade 5 was one of actually great appreciation . . . but the Grade 6 didn't give any response like that at all. So it surprises me and disappoints me just a little.

The teachers were aware of the major classroom elements and their thoughts indicate that while these features of the environment facilitate the teaching-learning process, they can be a source of concern for the teacher in the interactive setting.

At this macro-level of analysis there is no evidence to suggest an impact on teacher thinking with regard to the monitoring of ecological factors as a consequence of the in-service program.

ii. Instructional strategies. A second major aspect of the phenomena of teacher monitoring reflected in the teachers' interactive and non-interactive thoughts, was the monitoring of instructional behavior. This characteristic embraced awareness of the impact of instructional strategies, evaluation of the appropriateness of the instructional moves in achieving objectives and contemplation of alternatives. Thoughts were reported which indicated that in reflecting on their instructional strategies the teachers considered the integration of material, and the pace of the lesson. The reported thoughts also provide insight into the rationale behind student selection.

These various facets of instructional strategies are shown separately in Table 53. Thoughts concerning instructional strategies were commonly reported by the teachers with multiple reference being made in all lessons except 6.9.

(a) Reflection on Strategies: The teachers' thoughts indicate a constant assessment of the effectiveness of their teaching strategies.

Some of the reported thoughts disclose information concerning the reflective nature of the monitoring by the teacher of his own instructional behavior:

> T3.1: There were times I felt I maybe should have added a few more comments to what they had already said instead of just going from one person to another.

> T3.6: I was wondering about the questioning. I had been thinking about what sort of questions I was going to ask and I was wondering whether maybe I had chosen too many low-order questions . . . . I was wondering whether I had asked too many questions.

> T6.2: This is not going very well and I'm not that satisfied; something was wrong, it could be better and it has been better and I was looking for reasons as to why . . . . But I had started with this and I wanted it completed and so I didn't want to change it drastically.

This latter comment, similar to that of Teacher 3, "I thought I'd started it; I might as well finish what I'd started to do," corroborates Marland's (1977) findings regarding teacher reluctance to alter a planned lesson.

The comment by Teacher 6,

> T6.5: This was turning out to be a different approach from what I had intended.

indicates that in monitoring instructional strategies the teacher is

Table 53

Teacher Monitoring: Instructional Strategies

Substantive Components Showing Frequency of Distribution

	Teacher 3											Teacher 6										
	Pre In-service				Post In-service (a)				(b)		Total	Post In-service (a)								(b)		Total
Lesson	1	2	3	4	5	6	7	8	9	10		1	2	3	4	5	6	7	8	9	10	
1. Teacher Monitoring																						
ii Instructional Strategies																						
a) Reflection on strategies	1	1	1		1	3	1	2		2	12	1	2	1	1	1	1		1		2	10
Alternative strategies	1	1								1	3		2				1					3
Lack of alternative						1	1				2	1		1							1	3
Pace of lesson					2			1	1		4		2		2	2		1			1	8
Integration	1		1			1	1				4											0
Total	3	2	2	0	3	5	2	4	1	3	25	2	6	2	3	3	2	1	1	0	4	24
b) Pupil selection																						
Volunteers	1	1	1	2	1				1		7			1		1		1				3
Ability/difficulty	1	3		1					1		6											0
Child who knows							2		1		3	1				1						2
Total	2	4	1	3	1	0	2	0	3	0	16	1	0	1	0	2	0	1	0	0	0	5
Total	5	6	3	3	4	5	4	4	4	3	41	3	6	3	3	5	2	2	1	0	4	29

mindful of pre-instructional planning.

In some circumstances it is evident that interactive thoughts pertaining to the impact of the instuctional strategy influence subsequent behavior. This is exemplified by:

> T3.3: I thought I should have done one thing which I did not do. I should have mentioned to them I'd like you to read with good expression, loudly and clearly. I hadn't done that, so I thought after Laurie's part I'd mention that she'd read well, hoping the others would catch on.

In effecting this change of procedure the teacher displayed awareness of the impact of the instructional strategy as well as exhibited cognizance of the pupil's feelings, a phenomenon which will be discussed in a later section. The same teacher reported the following:

> T3.7: I had a student come up and work at the flannelboard and I had the charts. I was wondering about that because the children had to focus in two places, so I tried to stop and let the children watch the child at the flannelboard and then watch me.

A manifestation of the teachers' monitoring of instructional strategies was a reporting of speculative thoughts with regard to alternative strategies which could have been employed:

> T3.1: Maybe I should have gone over to him instead of being at the front and sort of looked at the sheet with him; it would have helped direct him.

> T6.2: I was wondering, asking myself, "Do I spend too much time reading?" Should I not say, "There it is, go to it."

Shavelson's (1976) contention that teachers lack a repertoire of teaching strategies is given some support by both teachers in this study who on five occasions reported situations in which they were unable to think of alternative courses of action.

> T3.7: I kept thinking it was too crowded; not only the chart but the board, and I really didn't know what else I could do.

T6.1: I was puzzled as to why that was a difficult concept and so the puzzlement bothered me because I couldn't think of another way of approaching it . . . .

T6.3: I was trying to determine if there was another way we could do it.

In monitoring instructional strategies both teachers attended to the pace at which the lesson was progressing and reported thoughts which denoted sensitivity to this element of the lesson. Table 53 indicates that Teacher 6 referred to lesson pace in five of the ten protocols with such comments as:

T6.2: It wasn't working very well; it wasn't moving along sort of quickly enough . . . .

T6.2: I thought it was dragging, and on the other hand there wasn't enough time to go onto anything else.

Teacher 3, on recalling a situation in which there was a lack of volunteers, stated:

T3.5: . . . there weren't that many volunteers; as I said the lesson was begining to dwindle, I felt that, and it's because I spent too much time on the introduction.

In assessing the impact of the strategy in this way, the teacher attributed blame for the failure to himself.

Most references to pace were negative, however Teacher 6 reports positive reaction to pace on two occasions, an example being:

T6.5: I did get the answer I wanted and happily got it quick enough that the momentum didn't die and we were able to go on.

Teachers reported attending to student participation and evidence of disruption and off-task behavior when gauging the pace of the lesson.

While the frequencies represented in Table 53 generally indicate a consistency of reference to these elements, Teacher 3 more than doubled the frequency with which reference was made specifically to teaching strategies after the in-service program, suggesting heightened awareness. In the same period Teacher 6 referred less frequently to instructional strategies (Table 51) and reflected less on such strategies (Table 53).

Reference by Teacher 3 to pace of lesson occurs only after the in-service experience. Teaching Strategy 27 (Appendix A) addressed maintenance of pace of lesson.

(b) Pupil Selection: A further aspect of teacher awareness of instructional strategies is reflected in teacher thoughts concerning pupil selection. From the protocols it is apparent that the thoughts which direct a teacher's behavior in selecting a particular pupil to participate are complex and multifaceted. The information processed by the teacher with regard to the class, the lesson and the pupil is similarly complex. Where concern for equal treatment for all class members motivates pupil choice or where desire to achieve greater involvement, or to compensate the child for a perceived deficit impacts selection, this will be considered under subsequent phenomenon. This section will address those aspects of pupil selection which form an integral component of instructional strategies.

Both teachers reported being conscious of choosing volunteers and this is supported by objective observation of lessons summarized in Tables 9 to 14. Some teacher comments suggest that in choosing volunteers on some occasions the teacher is being almost capricious:

> T3.5: I looked to see how many children had their hands up and I chose him - for no particular reason.
>
> I: Did you chose him for any particular reason?
> T6.3: No he had his hand up. He offered the answer.

On other occasions the practice of pupil selection appears to be integrally linked with the underlying belief that all pupils should be afforded an opportunity to respond, and unless other factors prevail this governs the teacher's strategy in selecting pupils. This is exemplified by the following teacher statements:

> T3.1: As far as choosing the people I thought I would choose one person from each row to go to the board so we got a cross section of everybody.
>
> T3.9: I usually use volunteers. I also try to see that as many as possible get an opportunity to work at the board. Everybody should have a chance.

The latter statement reflects the complex of issues to which the teacher attends in selecting a pupil to respond.

Pupil selection provides another perspective of teacher monitoring, particularly with regard to the effectiveness of instructional strategies.

> T3.4: I want everyone to participate. I think everyone should be given an opportunity and then it also gives me a chance to check on them and see how they're doing; whether they're understanding or whether they're covering up.
>
> T3.1: I know a certain person is having problems so I might select them if they have their hand up or if they don't; I might choose them just to see whether they are improving and are sort of learning.

Both teachers used pupil selection as a means of enhancing instructional strategy, employing a technique predicated on the monitoring of pupil progress.

> T3.9: I asked for a volunteer and I choose Terry. He told me earlier that he had finished and I thought I should give him an opportunity. He's good in math and he likes to show that he knows and I thought I should give him a chance. Since this is a new concept it is probably a good idea to get someone to explain it who knows.

The following comment by Teacher 6 demonstrates a similar strategy to that employed by Teacher 3, and serves to highlight the complex nature of teacher thinking which mediates teacher behavior:

> T6.1: I chose Frank because - I wanted the right answer but Frank is not necessarily someone I can get a right answer from but he is someone who needs the reinforcement of checking him to make sure he is still with us.

There is evidence to support the observation that teacher selection of pupils reflects a complex of variables among which teacher monitoring of instructional strategies is significant.

The frequencies with which reference was made in the protocols to pupil selection (Table 53) does not suggest increased awareness of this facet of instructional strategies as a consequence of the in-service program. However, the suggestion that a teacher may be reluctant to reiterate a statement regarding explanations of classroom practices may account for the higher frequency with which the issue of pupil selection is addressed in the pre in-service phase. Change in the teachers' overt practices with regard to pupil selection is demonstrated in Tables 9 to 14.

iii. Classroom management and control. Of all the variables impinging on teacher thoughts identified from the protocols of the twenty lessons, the aspect of the classroom milieu to which both most frequent and most constant reference was made was classroom management and control (Tables 50 and 51). Reference was not only made explicitly as the teachers recalled interactive thoughts centering on disruptive or off-task pupil behavior but also implicitly when they justified or attempted to rationalize some of their management strategies. These teacher thoughts represent constant awareness and monitoring of pupil interest, on-task activity and behavior, as well as a gauging of the effectiveness of management and control strategies.

Not all disruptive and off-task pupil behavior was overtly attended to by the teachers and the protocols recording both interactive and non-interactive thoughts provide insight into the aspects of pupil behavior which were monitored by the teachers and which impinged upon teacher behavior. Awareness of this selective attention to pupil behavior provides a basis for interpreting teacher strategies designed for the maintenance of management and control.

Tables 50 and 51 indicate increased awareness of issues of management and control after the in-service program by both teachers.

(a) Awareness of and Concern for Control and Discipline: In all, ninety four references which indicated teacher consciousness of an aspect of classroom control were made in the protocols of the twenty lessons. This is the highest frequency recorded both collectively and individually by the two teachers for a single element of any of the phenomena identified in Table 54, and attests to the level of teacher awareness. Reference was made by both teachers to this element in every protocol, with Teacher 3 recording almost a 50 percent increase in the rate of reference in the four lessons following the in-service experience.

Comments recorded in the protocols reveal that both teachers were constantly aware of pupil behavior, attending to such cues as noise level, distractions, restlessness, out of desk activity, inattention, off-task activity and quality of work.

While most comments reflected teacher concern;

> T3.2: I think it was obvious this morning even when I asked them to put their material down, there would always be someone who didn't want to - who still held it - and as soon as I started talking were back to touching things and not paying attention.

Table 54

Teacher Monitoring: Classroom Management and Control

Substantive Components Showing Frequency of Distribution

	Teacher 3											Teacher 6										
	Pre In-service				Post In-service (a)				(b)		Total	Pre In-service				Post In-service (a)				(b)		Total
Lesson	1	2	3	4	5	6	7	8	9	10		1	2	3	4	5	6	7	8	9	10	
1. Teacher Monitoring iii Classroom Management & Control																						
a) Awareness & concern for control & discipline	1	12	5	2	8	6	7	8	5	6	60	1	6	5	1	5	3	3	1	7	2	34
Lack of control alternative		2					1				3											0
Total	1	14	5	2	8	6	8	8	5	6	63	1	6	5	1	5	3	3	1	7	2	34
b) Avoidance of disruption						1	4	2			7			1		2		1			1	5
Level of tolerance	1	1	3		1	1			1		8							1			3	4
Non-verbal/signs	1	1	2		1	1	3	1	1	1	12	1		1		2	3	2		1	1	11
Wait/pause	1	4		1	4		1	2	1	1	15			1						1	1	3
Proximity	1	3	3		2		1	3	1		14		1	1								2
Questioning		1	1	1	3	1					7	1		1			1	1		1		5
Circumvention		2		1	3	2	5	2	1		16	1	1		1		1	2				6
Avoidance of confrontation		3		1	3	2			3		12											0
Total	4	15	9	4	17	8	14	10	8	2	91	3	2	5	1	4	5	7	0	3	6	36
Total	5	29	14	6	25	14	22	18	13	8	154	4	8	10	2	9	8	10	1	10	8	70

T6.2: I believe they weren't paying as much attention as they could have . . . I think I had that impression about the whole hour.

both teachers reacted positively when pupil behavior was assessed as being conducive to learning.

T3.3: When I told them they had good behavior . . . I meant it. I've done that several times to reinforce good behavior. I thought since they were kind of bad yesterday and they were good today I thought I'd reinforce it . . . . They behaved very well during the math lesson and all morning they were just quiet as mice.

The monitoring of classroom behavior was not always governed by consciousness of disruption, for as some teacher comments indicate, children whose past behavior had been cause for concern were afforded particular attention:

T3.4: I glanced over to see if Paul and Bruce were talking. Paul talks an awful lot; he's settling down but he used to just talk, talk, talk and get out of his desk and his work would always be disorganized.

A measure of the degree to which awareness of, and concern for control impinged on the thinking of Teacher 3 lies in the several references by the teacher to lack of alternative control strategies:

T3.2: I think I was really annoyed at this point because I think I had asked them several times to pay attention and they weren't and I was wondering what I should do.
I: What alternatives were you considering?
T: Well I just didn't have that many. I didn't know what techniques to use to get them to settle down.

While both teachers employed overt control measures such as a reprimand, removal of the child from the situation and detentions, a characteristic of the teachers' thoughts with regard to control and management were the measures considered to handle disruption in a low-key manner in a bid to localize the distraction.

(b) Avoidance of Disruption: Strategies used by the teachers to limit disturbances and refocus off-task behavior indicate that both teachers monitored the learning situation and took conscious measures to contain and minimize disruption. Reasons for attempting this varied. One reason was the belief that the whole class should not be penalized on account of one child:

> T3.6: That was his second or third time out [to the washroom] at this point. I didn't want to go and see where he was because I felt it would be disturbing the whole class, so I'd just leave him because it's only one individual and I don't think I should sacrifice the whole class for him.

Another reason was the desire to maintain the continuity of the lesson:

> T3.8: I was with the other group and I didn't want to interrupt them too much so I went over to him several times.

Teacher 6 articulated two further reasons for the approach; the first being to avoid drawing undue attention to either the recalcitrant pupil or to the misdemeanor,

> T6.10: It was just that it was a minor enough incident and I didn't want to give it any more notice than that.

> T6.5: [I wanted to do it] without disturbing, without drawing attention to the fact that I was reprimanding him again; just trying to do it as low level as possible.

and the second, an attempt to minimize his own reaction in a situation. This was achieved by writing the name of the child on the board to indicate a detention. No verbal reference was made either to the misbehavior or the detention.

> T6.5: It stems from me trying to keep more patience in my reserve. If I let my self get angry at small situations my patience is depleted . . . so I have been trying to minimize the times I get angry.

This action is linked to the phenomenon of Suppressing Emotions.

Reference to avoidance of disruption was made by Teacher 3 only after the in-service experience, and while one reference was made by Teacher 6 prior to the in-service program, it was reported in three protocols following (Table 54). This suggests greater sensitivity on the part of both the teachers as a result of the in-service program.

Level of Tolerance: In the context of discussion of strategies employed to avoid classroom disruption, it is evident from the protocols that both teachers had a threshold of tolerance for disturbance within the learning environment which was applicable to the group and to individuals.

> T6.10: I was wondering whether or not to continue with the lesson or wait until things were settled, but it wasn't loud enough to made me do that.

> T3.6: I thought as long as he isn't disturbing others, . . . to the point where he's bothering the whole class, I thought I'd leave him.

Several strategies used as means of achieving classroom management and control while limiting disruption were reported and reflected upon by the teachers. These strategies involved adopting a relatively low-key approach and included non-verbal techniques such as waiting, use of signals, physical proximity and use of questioning. Circumvention and the ignoring of disruption were also techniques to which reference was made.

Non-Verbal Techniques: A strategy considered by both teachers as a means of gaining control or refocusing attention was to pause and wait. It was a technique commonly used to settle the class at the beginning of lessons:

> T6.3: I can recall, I think, it was just a matter of waiting until people were ready to go I guess.

> T3.4: I was just waiting for them to settle down before I started.

This method was also used to regain pupil attention:

> T3.7: Well Warren wasn't paying attention. He was putting his new key tabs into his binder, and I thought I'd stop and wait so that he would pay attention.

This tactic was often considered in conjunction with others as the following examples indicate:

> T3.2: As you can see he often likes to talk while someone else is talking so I just pointed at him and stopped.

> T3.8: Maybe because it's a large class, but I find it's difficult to get them all to respond and pay attention when I want to give instructions. I always either have to go up to someone or wait.

The use of non-verbal signals such as eye contact, hand movements, pointing or a cough were reported by the teachers as management and control techniques.

> T3.6: Both of them were talking and I thought I should stop it. I thought I'd use hand signals or body signals instead of verbalizing.

> T6.5: I just motioned him to forget it, not to pursue it right now.

In elaborating upon the procedure of placing the names of disruptive or off-task pupils on the board Teacher 6 commented:

> T6.3: . . . that allows me not to get angry but it also gives them the indication that they have gone so far.

The teacher also noted that this non-verbal approach to control avoided confrontation with the pupil:

> T6.6: I didn't say anything - that was sort of an agreement I made. Before I used to verbally acknowledge that she wasn't doing what I wanted her to and then she started to respond very mouthy or lippy . . . .

Table 54 indicates that reference was made to the use of signals as a control measure by the teachers in sixteen of the twenty lessons.

The significance of the measure is represented by both the frequency and consistency of reference, however the increased frequency with which Teacher 6 referred to this tactic after the in-service experience suggests impact on teacher thought by that experience. Teaching Strategies 3 and 10 addressed these teaching behaviors.

A further method of conveying non-verbal messages adopted by the teachers, and one which also kept the control measure low-key, was for the teacher to use his physical proximity as a means of regaining or directing attention.

> T3.3: Instead of saying anything to David I thought I'd move over and touch him. He turned around. I didn't want to disturb Laurie's reading.
>
> T3.8: I noticed he hadn't been doing his work and he was out of his desk, so I thought that if I moved that way he'll probably know what I mean.
>
> T6.3: I decided to stay there until I saw him get back to work because he wasn't getting too much done. So I decided, "Well I'm going to stay here until I see something."

Teacher 3 used physical proximity as part of a control strategy to convey yet a different message.

> I: You've got your arm around him as you're talking to him . . . you're chastizing him.
> T3.5: Well I do touch them; I try to, I think it shows warmth.

This teacher sought to project warmth even when disciplining a child.

Teacher 3 commented upon the use of physical proximity on fourteen occasions in seven protocols, whereas Teacher 6 addressed the issue only twice, both prior to the in-service program (Table 54).

A final non-verbal technique used in maintaining control and management was the deployment of questions to gain pupil attention. By use of this method the teacher did not disrupt the flow of the lesson nor focus attention on the pupil for his off-task activity. This technique, employed by both teachers, is exemplified by:

> T6.6: I saw that he was talking to Peter so I just put him on the spot with the question.

Teacher 6 also reports using questions as a tactic for maintaining attention:

> T6.3: I sort of know I'm going to ask John and I think he sort of thinks I am going to ask him too . . . that way I'm building the expectation for him so he'd better be prepared.

In a similar non-verbal manner Teacher 3 used the allocation of questions as means of rewarding and reinforcing on-task behavior.

> T3.4: I thought I'd give him a chance because he's been behaving well and he raised his hand; he didn't talk aloud . . . I thought if he realizes that I approve of his good behavior maybe he'll continue with good behavior.

The frequencies in Table 54 do not suggest an impact on this strategy by the in-service program, however Teacher 3 recorded 43 percent of his references in the protocol immediately following the in-service course.

Circumvention: This strategy for avoiding or minimizing disruption involved the prevention of unwanted situations. Frequently this tactic was designed to facilitate classroom management such as dispensing with preliminaries before the commencement of the lesson to avoid subsequent interruptions.

> T3.7: Many times in the morning they want to show what they've been doing so I allow them to [at the beginning], otherwise they want to show it during the day.

In giving instructions both teachers noted salient details on the blackboard such as page numbers to circumvent the need for questions. In commenting on such a situation Teacher 3 observed:

> T3.6: I wrote it because I knew that perhaps he wouldn't remember it and I'd have to repeat it and it's much quicker just to write it down for him . . . .

Beside its use as a management strategy the teachers used circumvention as a control technique. Care was exercised to ensure the class was settled at the commencement of a lesson;

> T3.5: I thought I should get everyone's attention before I get started because if I don't . . . the problem of noise will get larger and larger and be more difficult to handle.

and distractions were removed.

> T3.7: Kim and Steven were looking at some pictures and I thought I might as well take them right away then because it's going to continue.

When a pupil was observed to be without a pencil the teacher acted quickly to provide one:

> T3.7: . . . otherwise he's just going to sit there and probably start interrupting somebody so I might as well give it and he'll be busy.

On reflecting on strategies for dealing with a fractious class Teacher 6 commented:

> T6.2: If it was quite noisy . . . then I would probably switch to an exercise that took a little bit more thought and concentration.

Of the twenty two references made to the tactic of circumvention, (Table 54) sixteen were made by Teacher 3 in seven of the ten protocols. Teacher 3 made mention of this tactic on three occasions prior to the in-service program and on twelve occasions in the four subsequent protocols. The frequency with which Teacher 6 reported thoughts on this issue appears unaffected by the in-service program.

Avoidance of Confrontation: In relation to the avoidance of disruption, on twelve occasions in five protocols Teacher 3 elected to ignore a disruption rather than confront it and so aggravate the situation (Table 54). Half of these events involved a particularly undisciplined child.

> T3.2: I usually leave him alone because he'll just become angry and start screaming and walk out . . . I've sort of learnt not to bother him.

On other occasions attention seeking behavior was ignored.

> T3.6: I knew Tony was acting up. He always wants attention . . . I was aware of what he was doing but I just ignored it.

These events seem to involve the judgment by the teacher, based on background knowledge of the children involved, that the best interest of the class as a whole is served by not drawing attention to the situation although it is in itself unacceptable.

No reference was made to this tactic by Teacher 6.

The significance of these techniques to the teacher in the maintenance of the learning environment is attested to by the frequency with which reference was made to them. The issue of avoidance of disruption and techniques of achieving it were mentioned a total of one hundred and twenty seven times by the two teachers (Table 54), with reference in all but lesson 6.8. Of this total, some 70 percent of the references were made by Teacher 3. The frequencies with which the issue is addressed in the various phases of the study do not suggest a systematic change.

iv. Teacher self monitoring. A fourth aspect of the phenomenon of Teacher Monitoring is teacher self monitoring which refers to thoughts which indicate that the teachers were conscious of, and reflected critically upon their classroom behavior. This differs from the monitoring of instructional strategies for emphasis is on awareness and evaluation of personal performance in executing the strategy rather than on evaluation of the strategy per se.

Self monitoring was contained in both interactive and non-interactive thoughts and addressed such issues as classroom performance, personal preparation and thoughts related to self image.

Tables 50 and 51 indicate that while Teacher 3 reported a higher incidence of self monitoring before the in-service course, Teacher 6 alluded to this issue with greater frequency after the intervention program.

(a) Performance: In total, ninety one references reflected teacher self monitoring, and of these 52 percent concerned awareness of the teachers' behavior in the classroom and the impact this was having on the pupils (Table 55). The following comments typify such thoughts:

T3.5: I obviously wasn't doing something right otherwise he would have been paying attention.

T3.6: I sort of think I blundered that beginning . . . I don't know, it was my questioning or whatever; I don't think I gave a good beginning . . . not a good explanation . . . I perhaps should have made some comments to clarify things.

T6.1: Partly I was thinking that this is something I should be doing; I should be walking [desk supervision] and perhaps in the past I haven't done it as much as I should. I should leave more time in my lessons to make this more a part of a lesson.

T6.4: I was a little embarrassed as to the mistakes I was making. I was in a rush . . . .

This self awareness was not confined to personal performance in executing a teaching strategy but it also included performance of broader teaching functions. Teacher 6 reports reaction to his own handling of a pupil experiencing difficulty coping with work at grade level;

Table 55

Teacher Monitoring: Self Monitoring

Substantive Components Showing Frequency of Distribution

	Teacher 3											Teacher 6										
	Pre In-service				Post In-service (a)				(b)		Total	Pre In-service				Post In-service (a)				(b)		Total
Lesson	1	2	3	4	5	6	7	8	9	10		1	2	3	4	5	6	7	8	9	10	
1. Teacher Monitoring																						
iv Self Monitoring																						
a) Performance	5	4	3	1	4	2	1	2	4		26	2	4	2	1		5	3	3	1		21
b) Preparation		1	1					1			3		1	1		5	4		1	1		13
c) Self image	1	4	2		2		1	2	1		13		3	3		4	1	1	2		1	15
Total	6	9	6	1	6	2	2	5	5		42	2	8	6	1	9	10	4	6	2	1	49

> T6.1: I can't say I've written him off totally, but I can't say that I am totally fair with him all of the time either . . . I tried to spend more time on him but the extra help didn't help . . . . That's another guilty spot in that maybe I should seek help for him somewhere . . . . It bothers me in a sense that I haven't done it.

The impact on teacher thinking of awareness and evaluation of classroom performance is suggested in the comment by Teacher 3 who was reflecting on her handling of an extremely disruptive pupil;

> T3.1: He would be here, yes at times, and other times he wouldn't be here. I came home and I couldn't sleep, . . . it really bothered me. I was wondering, because it was very disruptive and I felt I was having difficulty handling the class. It really upset me.

This suggests that the individual's self concept as a teacher was in question.

Frequently in monitoring their classroom performances the teachers, at least implicitly, ascribed blame to themselves. This is termed "internality" by Marland (1977) and Cooper (1979). Illustration of this characteristic is provided by the following excerpts:

> T3.2: . . . but I perhaps didn't explain myself properly.

> T6.2: . . . it could almost border on frustration, or even anger in a sense because they weren't going where I wanted them to. It's funny how a teacher always reacts angrily when a class isn't doing what he wants them to, because it's almost displaced anger because it's the teacher who's responsible for them not going there.

> T6.5: The guilt should have been assumed by me and not transferred in this way.

Heightened awareness of personal performance was recorded by Teacher 3 before the in-service experience.

(b) Preparation: Reference to personal preparation occurred sixteen times in the twenty stimulated recall protocols, thirteen by Teacher 6, who reported thoughts related to preparation in six of the ten protocols (Table 55). There was a significant increase in reference to this feature after the in-service program. While this may denote heightened sensitivity to the issue by Teacher 6, it may more particularly reflect the specific events of the lessons referred to (Appendix H).

In most instances these thoughts revolved around dissatisfaction with personal lesson preparation and the resultant effect in the learning situation.

> T6.3: I wasn't prepared for it and I blew the answer totally . . . .
>
> T6.9: I was apprehensive and thinking about whether this was going to be another mistake on my part . . . I was not that familiar with some of the prefixes.
>
> T3.8: I thought I hadn't thought it out carefully. I should have sort of pre-planned . . . .

(c) Self Image: Many of the reported thoughts which indicated teacher self monitoring reflected on the teacher's image of himself as a professional practioner. Several comments implied that the teachers monitored and assessed pupil attitudes toward teacher performance:

> T3.2: I didn't want to say anything to him because I find he doesn't respect me.
>
> T3.2: I often think they have no respect for me.
>
> T3.9: I'm sure that some wouldn't want to follow what I've said anyway and do it their own way.

The teachers also assessed their professional performance.

> T3.2: Sometimes it mades me feel that I'm defeated and perhaps haven't got good control.
>
> T3.8: I guess I was indifferent. I must be a heartless teacher.
>
> T3.8: Every once-in-a-while I sit down and I think to myself; am I meeting the needs of the students, you know, according to their difficulties?

Both teachers reported thoughts which reflected monitoring of personal characteristics.

> T3.2: My vocabulary is limited, being so much with children all the time.
>
> T3.7: . . . I think I was abrupt a few times because they didn't seem to follow my instructions.
>
> T6.6: I was particularly tongue-tied this morning.

Other comments denoted awareness of teaching style.

> T6.2: I don't like to carry a sheet around. I like to know what's coming next in my mind rather than having to refer to a book all the time.
>
> T6.3: I was thinking that I was much more relaxed and not worrying about what went on.

Referring to his stance on admitting to errors Teacher 6 stated:

> T6.6: . . . that's my style, if you want to call it that, . . . I prefer to have the discussion.

Both teachers referred to self image in seven of the ten protocols (Table 55), but the frequency with which the topic was alluded to appears unrelated to particular phases in the study.

2. Equality of Treatment

Pervading the protocols is implicit and explicit evidence that both teachers attempted to treat all pupils equally. Reference was made to equality of treatment on twenty four occasions in fourteen of the twenty protocols, with Teacher 3 responsible for 67 percent of them (Table 56). With regard to that teacher it is noteworthy that the incidence of reference to this issue which occurred prior to the in-service experience is not sustained, lending support to the hypothesis that on philosophical issues teachers do not reiterate a previously established view.

Table 56

Equality of Treatment

Substantive Components Showing Frequency of Distribution

	Teacher 3											Teacher 6										
	Pre In-service				Post In-service (a)				Post In-service (b)		Total	Pre In-service				Post In-service (a)				Post In-service (b)		Total
Lesson	1	2	3	4	5	6	7	8	9	10		1	2	3	4	5	6	7	8	9	10	
2. Equality of Treatment	4	1	3	2	1	2			1	2	16	2	1		1		2	1		1		8
i Differential Treatment	1	2	2	1		1			1		8	3	2			2		1	1	2	1	12
a) Principle of General Involvement	1	1	1	1		1				1	6								2			2
b) Principle of Compensation		2				1	1	1			5	4	1	1		1	3		1		1	12
Total	2	5	3	2	0	3	1	1	1	1	19	7	3	1	0	3	3	1	4	2	2	26
Total	6	6	6	4	1	5	1	1	2	3	35	9	4	1	1	3	5	2	4	3	2	34

This overarching principle was alluded to generally, in such terms as;

> T3.1: Well I try to see that everybody gets a turn to do something; if they don't get a chance in math they have an opportunity to come in front of the class during another part of the day.
>
> T3.6: Since the group was small I thought that everybody should try and have a chance at a response.
>
> T6.7: The previous question was on the other side of the room so I sort of shifted over. I don't know if it was consciously or not - just to spread out the questions.
>
> T6.9: I mostly try to give everyone a chance.

and can be inferred from Teacher 6's reaction:

> T6.1: Gee I've got to give this guy some time because he has a question and it's only fair.

Commonly this phenomenon was linked to pupil selection;

> T3.9: I usually choose volunteers. I also try to see that as many children as possible get an opportunity . . . . Everybody should have a change.

and was also associated with teacher monitoring:

> T3.4: Well I want everybody to participate. I think everybody should be given an opportunity and it also gives me a chance to check on them.

This predisposition to treat all pupils equally found expression with Teacher 3 in her approach to the two language arts groups, one of which comprised the top one third of the class:

> T3.3: I try to share time equally between the groups . . . I try to equalize it.

Despite this underlying orientation to the equal treatment of pupils both teachers recognized occasions when they consciously and purposefully differentiated treatment.

i. Differential treatment of pupils. Different treatment was revealed in relation to strategies the teachers adopted because of perceived needs or problems that existed in the classroom. Both teachers expressed the belief that the pupils should be treated as individuals; however, Teacher 6 indicated some ambivalence with regard to the implementation of this:

> T6.1: I sort of appeased myself, my conscience I guess; I'd given her the project [individual assignment] . . . if she wants something extra she can get it.
>
> I: To what degree do you think you can do that for all of them?
>
> T: Very little. In fact, in a sense I resisted doing it with her, till I just couldn't avoid it any longer.

Differential treatment resulted from reaction to pupil behavior. This is exemplified by the following statement by Teacher 3:

> T3.3: I think some youngsters get more attention because they require it more than others. Michael probably gets more time because he demands it . . . he'll do something to distract the class and then I'll have to pay attention . . . . It's not acceptable but I think you have to allow some room for him.

This reflects the principle of General Involvement as the teacher seeks to socialize the child into the classroom scene.

Earlier differential treatment was cited by Teacher 6 as the reason for continuing differently with a pupil:

> T6.9: He is somebody that I have to keep after and somebody I sort of want to keep after, like some people I don't want to . . . because I had a little more at stake with him this year and we had a pretty rough start . . . so I have more of an investment of time and effort in him so you don't just toss it away or give up on it.

Reflected in this statement is the phenomenon of Teacher Empathy.

The teachers did not always differentiate positively in favor of pupils, as was illustrated by Teacher 6's response to a boy whom he had described as exhibiting immature and childish reactions.

I: Do you make allowances for him on the basis of that?
T6.5: No, usually I short change him a little bit on the basis of that.

Differential treatment was referred to with an element of consistency by Teacher 6, occurring in seven of the ten protocols (Table 56). Teacher 3 made six of the eight references to this element prior to the in-service experience suggesting that the stimulated recall sessions were not viewed as discrete events and that having expressed a view the teacher was reluctant to repeat that view.

Two common forms of differential treatment displayed in the protocols were General Involvement and Compensation. This is in contrast to the wider range of tactics reported by Cooper (1979).

(a) Principle of General Involvement: Strategies were consciously adopted whereby pupils were involved in classroom activities for the purpose ~~of~~ developing some aspect of personality or to socialize them into the classroom routine.

> T3.4: I thought I'd give him a chance . . . he's been behaving well and he raised his hand and he didn't talk aloud. I thought . . . if he realizes that I approve of his good behavior, maybe he'll continue good behavior.

This reflects an underlying acceptance of equality. In explaining the need for differential use of praise, Teacher 3 reflects on the same boy:

> T3.10: . . . I think it would make Michael feel more accepted and know that he's worthy of something.

This principle was invoked by Teacher 3 on six occasions, four of which were before the in-service course, further supporting the suggestion that having stated a view in the stimulated recall setting teachers may refrain from restating that view.

(b) Principle of Compensation: Both teachers implemented tactics designed to compensate for perceived pupil disadvantages. In attempting to afford equality of treatment the teachers actively discriminated in favor of the reticent child and the less able pupil. This principle was invoked by Teacher 6 on twelve of the seventeen occasions it was identified in the protocols, commenting on it in seven of his ten protocols.

This principle is illustrated by the comments by Teacher 6 who, in recalling his reaction to an irrelevant question, stated:

> T6.1: Well this is John and I need more patience with him and I have to give him a little bit more than some of the others.

In the same lesson, in reflecting on the pathway he followed during desk supervision, Teacher 6 observed:

> T6.1: . . . there are one or two students who really need it [desk supervision] and it is the only time I do get to them because they won't come to me. The one girl . . . she will rarely come to me so this is one time at least during the day that I sort of make a point of going over to chat to her. If I don't do it that way I'll do it from the front . . . "Heather, how are you doing?"

This action also illustrates Teacher Monitoring and Teacher Empathy.

Thoughts related to this issue were reported more consistently by Teacher 3 after the in-service program, a fact which may reflect a changed level of teacher awareness.

3. Teacher Authenticity

This phenomenon is identified when the teacher reveals his human qualities in the teaching situation.

Any notion of infallibility was dispelled by the ready acknowledgment that teachers too make mistakes.

> T3.4: Well I make mistakes and I've mentioned to them that sometimes I make mistakes . . . because it's just normal.

> T6.6: I can make mistakes too. I don't want to set myself up as someone who doesn't make mistakes and also I don't want to be the type of person who makes a mistake and then tries to bluff my way out.

Both teachers indicated willingness, under certain circumstances, to permit discussion of their out-of-school activities in the class arena.

> T3.1: It depends on the topic but I like to share things I've done. I think they understand you more and you're not just a math teacher, but you have feelings.

> T6.2: I don't mind doing that [answering questions about life and sport]. I ask about their lives so I can get to know a little more about them; so I'm closer to them, so I don't mind answering basic questions.

This authenticity is perceived as providing a basis for mutual understanding as is inferred from a later statement by Teacher 6:

> T6.8: We have a pretty good relationship as far as that goes. I think she can talk to me and tell me things in that she's not that frightened. I think we're fairly good friends.

This approachability and availability is highlighted in the comment:

> T6.3: . . . up to this point I've been telling them that if they ever have any troubles I'm here and I'll stay anytime . . . if they want help all they have to do is come and ask.

While the protocols of both teachers contained evidence of Suppressing Emotion (a phenomenon discussed later), circumstances were reported where they were prepared to reveal their affective state.

> T3.2: Sometimes you have to show emotion if you're laughing or maybe you have to show sadness . . . well you can show anger too. The children have to realize you get angry too.

This appears to reflect a studied approach to presenting the image of the teacher as a feeling being. Teacher 3 illustrates the depth of this, when, reflecting on a perceived lack of responsiveness to the children, commented:

> T3.10: I did it that way because there were just too many words and it would be sort of tedious and not meaningful I suppose, and not sincere.

This phenomenon was evidenced on seventeen occasions in eleven of the twenty protocols (Tables 50 and 51). Teacher 6 differed from Teacher 3 in the consistency of reference to the phenomenon, with the latter recording four of the six references prior to the in-service course. Teacher 6 referred to this phenomenon in each phase of the study, with most frequent reference after the in-service program.

4. Teacher Empathy

A phenomenon identified in the stimulated recall protocols closely resembling Teacher Authenticity, but more obvious in its affective orientation, is Teacher Empathy. This phenomenon encapsulates both the "warmth" and "empathy" variables (Teaching Strategies 25,26) contained in the High Inference Data Schedule component of the Observation Schedule.

In this macro-analysis of the protocols Teacher Empathy refers to expressions of concern and caring for, understanding of, and sensitivity to pupil feelings and interests.

This phenomenon was frequently expressed as awareness of the reaction of the pupils, a projection of teacher emotions concerning the pupils, and protection of pupil feelings. In most instances it involved background knowledge of the pupils which the teachers took into the situation, a phenomenon to be considered in a subsequent section.

Although the teachers were relating to relatively large groups they were both mindful of the individual and were prepared to adapt instructional strategies to the individual.

> T3.1: One of the boys kept talking on and on and on and I didn't want to interrupt him . . . it may be the one experience he knows a great deal about.

This awareness of each individual extended beyond the learning situation and embraced the pupil's out-of-school experiences. The teachers were conscious of the need to know more about the variables affecting each child so enabling them to relate to the children more meaningfully.

> T3.5: Well I feel perhaps I don't spend enough time with him. He's a bus person and if maybe he was in the neighbourhood I could spend a few minutes after school talking to him and getting to know him better.

This is further exemplified by Teacher 6, who on observing uncharacteristic behavior by a boy reported:

> T6.10: I asked, "Is there something wrong? Do you have troubles at home or school?" . . . I cared enough for him to want to know what was going on.

Awareness of each pupil as an individual was based on a sense of respect and valuing;

> T3.1: I think their sentences are important because it's just the way they speak. It's just part of them.

> T3.1: I think I was listening just to their ideas . . . I was mainly interested in them, you know, the kind of experiences they had.

> T3.3: . . . I'll show that I trust him.

and formed the foundation for teacher-pupil relationships:

> T6.5: . . . he's interested in a million things I am and I can reach him, I can relate to him better that way.

Consciousness of pupil feelings is evident in the protocols and ranges from awareness of feelings, through identification with the feelings, to measures taken to protect pupil feelings.

> T3.1: I thought maybe they thought I wasn't listening to them enough, or wasn't feeling what they were feeling.

Of class members of other than Canadian background Teacher 3 reported:

> T3.3: I often wonder how they feel, whether they feel accepted or wanted or do they feel lonely and left out or do they feel different . . . .

A sense of belonging was actively fostered by Teacher 6 and in describing the measures taken to help one girl feel she belonged in the group, he stated:

> T6.8: Just to let them know "Hey, I noticed you're gone", "Nice to have you here", and that's all I was trying to do with Pauline, because she isn't a high ability student, so just the fact we could establish a sort of friendship was my primary goal.

Deliberate measures were taken to protect the feelings and self concept of individual pupils. In pursuing a correct answer, Teacher 3 notes:

> T3.2: I asked her to do another one [problem] because the first one she did was incorrect so I thought I'd see if she understands and she didn't want to, so I didn't say anything because I know she's quite sensitive.

Instead of disciplining one boy individually Teacher 6 directed the reprimand at a larger group:

> T6.5: . . . so he doesn't feel it himself so much personally.

To avoid peer ridicule when an incorrect answer was given, Teacher 6 reports adopting the following strategy:

> T6.6: . . . if someone's answer is way off, then I may have seen what thought they were following and point that out to the class, or I might say, "Hey, you guys aren't always right either."

Teacher sensibilities were aroused by their sensitivity to pupil feelings. This is poignantly exemplified by the following comment by Teacher 6:

> T6.3: I thought, "Ah nuts Peter", you know. Sort of felt sorry for him; sort of felt a little depressed in that I couldn't feel happy that he'd remembered and I couldn't feel hopeful, you know, that he can do well.

Both teachers were aware of feelings for the class members and were conscious of projection of feelings.

> T3.2: I suppose I don't touch them enough to give them a warmth; a feeling of warmth and caring [however] I think they feel I'm interested in them and I like them and I think they want to be liked.

Teacher 6 describes a more obtuse strategy for projecting his feelings for a pupil. This was through the allocation of questions:

> T6.3: . . . it's sort of my way of making sure that John is always aware, and that I haven't given up on John yet and a couple of others perhaps.

The frequency and consistency of appearance of this phenomenon in the protocols suggests its importance in teacher thought processes. Each protocol of Teacher 6 (Table 51) contained reference to this phenomenon with an increase in frequency apparent after the in-service course. Coder ratings on the high inference variables (Table 16) reflect an increase on both the "caring" and "empathy" variables for mathematics between the pre in-service and post in-service (b) ratings but a decrease on both in language arts.

Of the references to this phenomenon in the protocols of Teacher 3 (Table 50), some 75 percent occurred prior to the in-service program. Reference to Table 16 reveals that in the pre in-service - post in-service (b) period Teacher 3's ratings on "caring" did not change for language arts, but increased in mathematics. On "empathy", ratings in language arts decreased while those in mathematics increased. The reduced frequency with which Teacher 3 expressed empathetic thoughts after the in-service program was not perceived by the coder to be paralleled in overt behavior. This further suggests that teachers may not repeat a belief or attitude expressed in an earlier stimulated recall interview.

5. Suppressing Emotions

This phenomenon, also identified in the studies of Marland (1977) and Conners (1978), involves the suppression and masking of feelings that were being experienced in the interactive situation. Marland (1977:219) notes that, "at times, mainly when they were under duress teachers strove to suppress the feelings they were experiencing."

Macro-analysis of the protocols in this study reveals that suppressing emotion was almost exclusively in reaction to pupil misbehavior and off-task activity, however it was also evident as a management strategy.

The teachers' propensity to avoid or minimize disruption appears to be one reason for invoking this behavior, and both report physically withdrawing from emotionally disturbing situations:

> T3.2: I usually leave him because he'll become just so angry and start screaming . . . he'll kick me if he wants to.

> T6.2: If I had stayed and quizzed him any longer [over scribbled work] my anger would have risen to quite a high level . . . .

Adoption of this behavior by the teachers was based on a view of themselves as an emotional catalyst. Teacher 3 in reacting to extreme and constant misbehavior by one undisciplined boy commented:

> T3.6: Well I told Michael to sit down . . . I just said it in a normal voice. I find when I get really firm with him he just rebels, so it's better to leave him alone rather than cause a scene . . . so I tried to be calm and nice . . . when you're handling discipline problems you should try to be calm.

A strategy employed by Teacher 6 of placing the name of misbehaving children on the board exemplifies this notion that teacher reaction can influence pupil reaction.

T6.3: That way I don't have to get angry myself and of course when anyone yells at someone the obvious reaction is for them to get up tight too, so this way it doesn't happen.

Conscious monitoring of personal reaction further illustrates how teacher feelings are controlled in order to avoid inflaming negative pupil response. On observing blatant evidence of off-task activity Teacher 6 recalled:

T6.9: The first reaction that you want to have is one of anger . . . you sort of have to take a deep breath and then say, "Let's try for a little more patience . . . ." There is anger feeling there but I also knew it wouldn't do me any good to get angry because it would just turn him off.

Suppressing emotion appears to provide teachers with a means of protecting their personal feelings and is effected by conscious decision. Teacher 6 reflected:

T6.3: . . . I do try to minimize the number of times I get angry. That's for my own good, not for theirs. I just don't want to be all tight and unrelaxed, that's all.

This attitude is embodied in the response:

T6.2: I was really annoyed and I didn't really accept his explanation . . . I could have pursued it further.
I: Why didn't you?
T: Just because I didn't want to. I didn't want to become any more annoyed.

Teacher 3 demonstrates the protection of his own emotions when, trying to engage the undisciplined boy referred to previously, he recalled:

T3.9: I don't think I was angry with him or anything. I think I was just indifferent.

This represents a withdrawing of emotional reaction. Suppressing emotion could be seen as related to a low-key approach to discipline.

This phenomenon was referred to more frequently and consistently by Teacher 6, appearing in six of the ten protocols (Table 51), however there is no evidence to suggest a change in the frequency with which this teacher reported thoughts which reflected this phenomenon as a consequence of the in-service program. The total thoughts of Teacher 3 evidenced fewer examples of this phenomenon after the in-service program.

6. Cognitive Linking

Macro-analysis of the stimulated recall protocols revealed frequent instances of teacher reports of interactive thoughts about past and future events which served to impact teacher classroom behavior. In reporting thoughts of this nature the teachers sometimes included non-interactive thoughts by way of elaboration.

Cognitive Linking is distinguished from the phenomenon of Case Histories in that the events referred to were specific rather than general and commonly served to link past and future lessons to the interactive situation being recalled. Reference was made to such issues as lesson content, classroom procedures and pupil behavior, competencies and achievement affecting classroom behavior. Both teachers reported adapting their instructional strategies to accommodate information recalled from previous lessons and to capitalize on previous classroom experiences:

> T3.4: The reason I put the number lines on the overhead projector was because I knew they had difficulty drawing them the other day, so I thought I'd spend quite a bit of time on them.

> T3.1: If we've discussed suffixes before and I know a certain person is having problems I might select them . . . to see if they are improving and sort of learning.

Teacher 6 recalling probing questions posed to one pupil, stated:

> T6.7 I did it because I knew she was capable of the answer . . . I knew that I could expect a good answer and some good thought.

The linking of past learning experiences to future experiences is exemplified by Teacher 3's strategy:

> T3.9: Well I'm writing things down for them to review so that they can recall and see differences as to what they've done and what they're going to do.

Teaching strategies designed to facilitate pupil recall were employed:

> T3.4: I thought I'd demonstrate a couple of examples just to refresh their minds about what we've been doing the last few days.

> T6.1: I try to make sure that I review what I've done the previous day so it's brought back into mind.

There is evidence to suggest that classroom management and control was also affected by the teacher's cognitive linking. In the example cited below the teacher's cognitive linking facilitated circumvention of disruptive behavior.

> T3.6: Michael wasn't doing much and I thought I would read the instructions to him. He usually says that he doesn't know what to do and it's because, I feel, he doesn't read the instructions . . . I thought I'd give him the instructions hoping that he'd go ahead and start working because I've found if I've given the instructions to him individually he would work at times.

Teacher reaction to pupils was mediated by this characteristic of teacher thought. This is illustrated from a protocol of Teacher 3:

> T3.2: I know that Craig has difficulty with math and I thought that he would probably have problems and that's why he wasn't getting started. I think he doesn't like math very much because he knows he has problems . . . that's why I stood there and got him started.

This phenomenon was identifiable on fifty three occasions, being evident in eighteen of the twenty protocols. Its significance is reflected by the frequency and consistency of occurrence (Tables 50, 51). Thoughts related to this phenomenon were reported more frequently by

Teacher 6 before the in-service experience.

The importance of this phenomenon is the recognition that teachers do not perceive lessons isolated from preceding or proposed events.

7. Rules

Statements reflecting teacher thoughts concerning rules and their enforcement occurred on thirty occasions in fifteen of the stimulated recall protocols. Most rules and procedures to which reference was made were guidelines designed to enhance and facilitate classroom management and control. These rules addressed such issues as procedures for entering the room, movement within the room and to the washroom, attending to the teacher if he pauses during instruction and observing one's turn before answering or seeking attention.

In Tables 50 and 51 the higher frequencies recorded in protocols 3.5, 3.8 and 6.5 conceivably reflect the impact of the in-service experience in which teaching strategies addressed the use of rules.

8. Beliefs

Throughout the protocols reference was made to beliefs which the teachers hold and which impinge on instructional behavior. These statements refer to characteristics and behaviors related to school children which the teachers accept as being true.

In the twenty protocols forty nine references (many of which were implied rather than explicit) were made to beliefs (Tables 50, 51). Of these forty were contained in the protocols of Teacher 3. Only four protocols contained no reference to beliefs.

The beliefs expressed or alluded to ranged widely across such issues as characteristics of children, use of reinforcement, individualization, instructional techniques, control strategies and graduation of difficulty. The following examples illustrate these beliefs:

T3.3: I think youngsters at this level want to please the teacher.

T3.3: I should always start with smaller numerals and work to larger ones.

T3.9: I think most children are cooperative. When you ask them to do something they do it.

T6.3: Well everyone is actually quite different.

T6.9: I don't over use praise believing that over used it begins to mean nothing.

There is no evidence of systematic change in the frequency with which the teachers referred to beliefs over the course of the study.

9. Case Histories

A notable characteristic of the stimulated recall protocols is the statements which indicate that teachers process information about pupils in addition to that information which is generated in the particular interactive situation. The information which the teachers take into the interactive situation with them concerns the backgrounds of the pupils and this information serves to mediate the teachers' reaction to, and interaction with the pupils.

Marland (1977:92) identifies these case histories as comprising "mental inventories of facts, opinions, beliefs, attitudes, expectations and such like that they hold in respect of individual students." Details in Tables 50 and 51 indicate that seventy three references were made to such information and reference was made in every protocol except 6.4. Statements varied from a brief comment such as;

T3.5: He's from a single parent home, and I think he's moved a great deal.

T6.6: I know what her reaction's going to be; she's going to be resistant or defiant.

to detailed and elaborate statements:

T6.5: I offered to have him moved to my room because he was having such an effect on the other class. He's just really a silent leader . . . . He's older, quite tough in a sense and we had a pretty good talk about it in the room before he came . . . . I told him when he came in that if he didn't do his work, which is a decision of his, that's fine but I don't want you bothering anybody else . . . I can't slight him in the least because he sits there and does his work . . . . I'm a little afraid to make too much of an issue with him because I'm not sure yet how volatile he is. I don't know how strong his position is in the room.

Stated broadly, the teachers used the background information they possessed as a context within which to interpret pupil achievement and behavior and as a basis for establishing expectations. This phenomenon is more global in extent than described in a previous section with respect of interactive thoughts concerning pupil information.

The consistency with which this phenomenon appears in the protocols suggests that this aspect of teacher thinking is deeply ingrained and provides a context for teacher-pupil interaction.

The phenomena identified in this study differ from those identified by Marland (1977), Conners (1978) and Cooper (1979) most notably in the perceived significance of Teacher Monitoring and Teacher Empathy, both of which provide a different perspective of, and dimension to teacher thought as revealed through stimulated recall.

Impact of Stimulated Recall

Introspective methodology was used in this study in an attempt to determine whether change occurred in teacher thinking over the period of the study. An issue which must be addressed in analyzing the data presented in this chapter is whether the technique of stimulated recall itself resulted either in changed overt behavior or changed thought processes.

Detailed in Chapter III are the measures that were taken in order to maximize the validity of the stimulated recall data. These included the establishing of rapport between subject and researcher based on communicated authenticity, positive regard for the other person and empathy (Fuller and Manning, 1973). To minimize the obtrusiveness of the researcher and videotaping equipment in the classroom a period of familiarization was observed. In order to reduce the impact of self confrontation (Bedics and Webb, 1971; Fuller and Manning, 1973; Dawson, Dawson and Forness, 1975) both teachers viewed videotapes of themselves in this familiarization period. Every care was taken to ensure that the stimulated recall interviews were conducted in a non-threatening, non-evaluative atmosphere. Complete anonymity was guaranteed.

Despite these positive measures the question remains of whether teacher behavior or teacher thought processes were impacted by any facet of the stimulated recall technique; that is, the videotaping, self confrontation or the interviews. Data from several sources will be presented in a bid to resolve this issue.

At the conclusion of the final stimulated recall interview questions related to the teachers' perceptions of the impact of the study on either the pupil's behavior or their own behavior or thoughts were posed. Both teachers claimed that they did not consciously change their classroom behavior because of their awareness of the researcher or of being videotaped:

> T3.10: I think I conducted the lessons the way I normally do except I think I was a little more nervous . . . .
>
> T6.10: Well that was one thing I set out to do when you approached me, in that I didn't want to change anything just for the sake of the camera . . . . I generally came in and taught the way I would, so that if I wasn't prepared then you could see that.

Initial awareness of their physical image was reported by both teachers, and while this did not remain a focus of attention, physical characteristics were reported as being noticed throughout the study.

Teacher 3 reported heightened awareness of lesson planning as a result of the pre-instructional interview in which the teacher was asked to describe the planning phases that had been followed in developing the lesson. In these interviews the teachers' responses were accepted and no follow-up questions asked in order to avoid the inference that planning phases had been missed, or that a different sequencing was more appropriate (Appendix C).

> T3.10: I think it's really made me much more aware of my planning of my lessons. Not so much my math but my language arts. I think I've particularly been more aware of the objectives. I mean I've had general objectives but I think I've tried to be more specific.

This teacher also attributed increased awareness of lesson planning to involvement in the in-service program.

Increased awareness of interactive thoughts was reported by both teachers:

> T3.10: I've certainly become more conscious of what I'm thinking.

T6.10: Most certainly my thoughts have changed because I was always - generally when you were filming I was thinking, "What's going to be my reply when he asks about this?" or "How is this looking?"

From these comments it would appear that heightened sensitivity to several aspects of their classroom practices resulted from their participation in stimulated recall; however, to what degree were the teacher's perceptions supported by the data contained in the stimulated recall protocols or the data collected by the coder?

While four lessons were videotaped for the purpose of stimulated recall before the in-service program, four in the post in-service (a) phase and a further two lessons in the post in-service (b) phase, additional lessons were observed and coded as part of the larger study. These additional data permit inferences to be drawn regarding changes in the overt classroom behavior of the teachers as a result of the researcher's presence, awareness of being videotaped or the anticipation of the stimulated recall interview. From the data available no assessment can be made of the impact of the coder on teacher behavior.

Reference to Tables 5 and 6 shows that the organization of the teaching space and the use of groups did not vary on account of lessons being videotaped. Tables 7 and 8 indicate that the nature and extent of instructional materials used was independent of the presence of the researcher. Inspection of the low inference process data contained in Tables 9, 10, 12 and 13 suggests that teacher-pupil interaction did not vary systematically on the basis of whether the lesson was being videotaped for the purposes of stimulated recall.

The teachers' ratings on each of the thirty one variables of the high inference data were graphed by individual lesson (unlike the data presented in Tables 16 to 21 which were based on the mean rating for each phase of the study) in order to infer whether the teachers' behavior reflected a change due to the presence of the researcher and recording equipment. An example of this data is shown in Tables 57 and 58. These data suggest that Teacher 3 engaged in less monitoring of seatwork when lessons were being videotaped.

Table 57

High Inference Rating by Subject Area
on Variable 4 - Teacher Three

		Lesson	Rating on Five-Point Scale									
			Language Arts					Mathematics				
			1	2	3	4	5	1	2	3	4	5
Pre In-service		1		v						v		
		2			v						v	
		3				x					x	
Post In-service	(a)	4				x				v		
		5				v						x
		6			v						v	
	(b)	7				v					v	

Note: v. videotaped lesson x. lesson not videotaped

Table 58

High Inference Rating on Variable 4
Teacher Three

		Lesson		Rating on Five-Point Scale				
				Total Lessons				
				1	2	3	4	5
Pre In-service		1	L. A.		v			
		2	Math			v		
		3	L. A.			v		
		4	Math				v	
		5	L. A.				x	
		6	Math				x	
Post In-service	(a)	7	Math			v		
		8	L. A.				x	
		9	Math					x
		10	L. A.				v	
		11	Math				v	
		12	L. A.			v		
	(b)	13	Math				v	
		14	L. A.				v	

Note: v. videotaped lesson x. lesson not videotaped

Analysis of these graphs suggests that the coder perceived Teacher 3 as exhibiting somewhat different classroom behav[illegible] on Variables 2, 4, 5, 12, 17, 21, 29 and Teacher 6 on Variables 4, 6, 8, 10, 12, 17, 21, 24, 26, 29 when the lessons were being videotaped. These variables are described in Appendix A and the graphed data is presented in Appendix J.

For some variables the relationship appears to be subject-related as with Teacher 6 on Variable 4 (Table 59), where the teacher was rated as exhibiting less monitoring behavior in mathematics lessons that were being videotaped, whereas no systematic difference was observed in language arts.

Table 59

High Inference Rating by Subject Area
on Variable 4 - Teacher Six

		Lesson	Rating on Five-Point Scale									
			Language Arts					Mathematics				
			1	2	3	4	5	1	2	3	4	5
Pre In-service		1	x									x
		2			v					v		
		3		v							x	
Post In-service	(a)	4	v						v			
		5	v							v		
		6		x							x	
	(b)	7			v						v	

Note: v. videotaped lesson x. lesson not videotaped

Individual protocols of the stimulated recall interviews contain evidence of the impact of the stimulated recall on the thoughts and behavior of the teachers. Some of the comments reflect self confrontation and awareness of strategies. Teacher 3 commented on his poor phrasing of questions:

> T3.3: See right there I do the same thing two times. That's not very good. They don't listen then the first time.

Having viewed a videotaped segment showing latecomers entering the room in a well regulated manner, the researcher asked whether this behavior had been governed by class rules. Teacher 3 responded:

> T3.2: Well I suppose I haven't really told them about coming in late. I'm glad you're pointing this out to me. I can do something about it.

On viewing a videotaped segment of a mathematics lesson, Teacher 3 stated:

> T3.4: Oh I know what's going to happen!
> I: You know what's going to happen next?
> T: Yes, I see my mistake already. I didn't move the materials together. I should have shown that they were joining.

As described in Appendix F, videotaped lessons focused on the teacher and for this reason the equipment was located in the rear corner of the teaching space. This afforded the teacher a different perspective of events when viewing the videotape for stimulated recall. On noting a control strategy, Teacher 3 observed:

> T3.5: Well I don't want to keep harping at them. I just wanted to say it in a softer tone, but I see he hasn't responded because I've gone to the front of the room and he's turning around and I've just finished telling them that they were all to look at the flannelboard.

Similarly, Teacher 6 noted:

> T6.4: I remember seeing her go this way when I was first sitting down, but now that I look at it, if I had seen what she was doing I would have said something.

How experiences such as these served to change the subsequent thinking and behavior of the teachers is open to conjecture.

The familiarization procedures, which have been discussed previously, were followed in preparation for the videotaping of lessons for stimulated recall with both teachers. On the basis of general observation and teacher demeanor in the stimulated recall sessions of the first four lessons the researcher was satisfied that the familiarization period had served its purpose. The teachers seemed unconcerned by the presence of the researcher and equipment, or by the stimulated recall experience. However, in the stimulated recall session following lesson 5, which was the first lesson after the in-service program and separated from the pre in-service lessons by one month, as an aside Teacher 6 remarked:

> T6.5: Something - an aside in general about this experiment. By the end of the last session, the fourth one, my confidence was fairly low, quite low.
>
> I: Confidence?
>
> T: As far as appearance and what you would be observing and so on. I'm personally surprised at this feeling too because I didn't think it would affect me that way, but I'm not impressed with what I see here [video replay], just from a personal standpoint. I think from a professional standpoint I do many of the things I'm supposed to do as far as classroom management and so on, I still feel very satisfied, but I'm not too sure if I like that guy there . . . . I'm watching myself and I'm not too sure that I like that guy.

This teacher had given no previous indication of being discomforted by the stimulated recall interviews. No further comment was initiated by the teacher in the remaining stimulated recall sessions but the issue was alluded to after the final stimulated recall session in response to the researcher's question as to whether the teacher's behavior had changed because of the videotaping of the lessons.

> T6.10: . . . I was mentioning this to you before that I was not liking what I saw. I didn't care for that guy in there . . . . Well actually it's a little more depressing now because I still sort of feel that way and it's more depressing because I find that I'm still like that and I still feel that way and I haven't changed you see. So it's something I'm still wrestling with and it's something that I will probably not do a heck of a lot about because it's still me and I don't know how much of that I can change . . . .

To what degree this teacher had been sensitized to the in-service program because of his involvement in this study cannot be traced from the data. Similarly it is necessary to accept his perception that he had not changed his classroom behavior despite the fact that he had identified the need for change in the videotapes used in the pre in-service stimulated recall sessions. Comments of this nature by the teacher lend support to Dawson, Dawson and Forness's (1975) claim that self viewing informs the teacher of how much he differs from his self expectations.

While the frankness of these disclosures by Teacher 6 attests to the rapport that existed between the teacher and researcher, they raise a basic issue with regard to familiarization procedures in research where stimulated recall interviews are separated by significant periods of time, that is, in longitudinal studies. Should subsequent familiarization procedures be observed preparatory to each phase? If so in what ways would they need to differ from the initial procedures? What lapse of time constitutes a "significant" period of time? With more frequent and widespread use of introspective methodology these issues require investigation.

Validity of Introspective Data

The issue of the validity of data obtained by means of introspective methodology has been addressed by researchers since Bloom (1953) and Gaier (1954) attempted to establish it by means of inference. Almost a quarter of a century later Marland (1977:227) could only state, "validity . . . can be assumed but not demonstrated or guaranteed."

In order to maximize the accuracy and completeness with which thoughts were reported in this study, the following steps were adopted:

1. a comprehensive period of familiarization was observed to lessen observer obtrusive effects;
2. rapport was established with the teachers and the interviews were conducted in a non-evaluative, non-threatening environment;
3. all stimulated recall interviews were conducted within 24 hours of the videotaped lesson.

During the interviews the following features were observed. Firstly there appeared to be consistency or concordance between what was observed on the videotape and the interactive thoughts reported by the teachers. In Harré and Secord's (1972) terms this reflected authenticity. Secondly both teachers anticipated accurately overt events in the recording. Bloom (1953) and Gaier (1954) inferred from this the ability to recall covert events. Thirdly, the willingness demonstrated by the subjects to report that they could not recall their thoughts in a particular situation and while it was not a common response it occurred sufficiently to indicate that the teachers did not feel pressurized to fabricate a response to satisfy the demands of the stimulated recall situation.

Summary

The purpose of this section is to summarize the data presented in this chapter from the perspective of change which was identified in the teachers' classroom behavior or thinking over the period of the study.

Table 60

Summary of Change Identified in the Data

Data	Teacher Three	Teacher Six
LOW INFERENCE DATA (Tables 5 - 15)		
Classroom Layout and Grouping	. Additional row of desks introduced after in-service.	. No change.
Instructional Materials	. Pre in-service use continued.	. Pre in-service use continued.
Teacher-Pupil Interaction		
Grouping mode	. Continued whole class instruction in math. . Two ability groups in lang. arts.	. Continued whole class instruction in both subject areas.
Question type	. High proportion of product questions in all phases of study. . Decrease in product questions in lang. arts post in-service (a); increased post in-service (b).	. High proportion of product questions in all phases of study. . Increase in product questions in math post in-service (a), reduced post in-service (b).

Table 60 (continued)

Data	Teacher Three	Teacher Six
Pupil selection	. Lang. arts: increased selection of volunteers. . Math: increased use of pre-selection.	. Lang. arts: increased selection of volunteers; decreased acceptance of "call-outs". . Math: pre-selection most common basis for selection; proportion decreased post in-service (a) to increase above initial level post in-service (b).
Praise & criticism	. Limited use of both. . No change in frequency of use.	. Limited use of both. . Increased use of praise after in-service; decrease at post in-service (b). . No criticism after pre in-service.
Teacher response	. Lang. arts: increased proportion of sustaining responses. . Math: decrease in sustaining responses after in-service; increase to initial level at post in-service (b).	. Decreased proportion of sustaining responses after in-service; increase at post in-service (b), to approximate pre in-service level.

Table 60 (continued)

Data	Teacher Three	Teacher Six
HIGH INFERENCE DATA (Tables 16 - 21)		
Change Pre In-service to Post In-service (a)	. Widespread change across teaching strategies. . Significant negative changes outnumbered significant positive changes.	
Change Post In-service (a) to Post In-service (b)	. Increased number of strategies in which significant change observed - in both grades and in both subjects. . Major proportion of change over this period was positive in direction. . Highlighted in these data was the apparent impact of the time lapse (one month) between the two periods of observation. . Significant change occurred on some teaching strategies where significant change had not occurred in the period pre in-service to post in-service (a). . Change in the opposite direction from initial change.	
Change Pre In-service to Post In-service (b)	. High incidence of significant change. . Significant positive change outnumbered significant negative change with each teacher for both subject areas except Teacher 6 in lang. arts. . Fifteen cases existed where overall change was zero although change had occurred either i. pre in-service - post in-service (a) ii. post in-service (a) - post in-service (b) highlighting the impact of the period between post in-service (a) and post in-service (b).	

Table 60 -(continued)

Data	Teacher Three	Teacher Six
Patterns of Change	. In 37 percent of subject-strategy patterns the direction of original change was maintained. . In 51 percent of subject-strategy patterns, direction of original change altered in month between post in-service (a) and post in-service (b).	
Subject Area & Change	. Change in overt use of teaching strategies is subject area related. . Significant change in same direction occurred on only four teaching strategies with Teacher 3 and six with Teacher 6. . Change in opposite direction for the two subject areas was recorded on five strategies with Teacher 3 and Teacher 6.	
TEACHER PLANNING (Tables 22, 23)	. Objectives consistently reported as first element address in planning after in-service.	. No change in approach to lesson planning.
STIMULATED RECALL DATA Micro-Analysis of Interactive thoughts (Tables 24, 25)		
Instructional Strategies - Methodology (Tables 26, 27)	. Increased proportion of thoughts in this category over course of study. . Increased percentage of thoughts related to strategies after in-service	. Decrease in thoughts associated with monitoring after in-service. Decrease not sustained post in-service (b).

Table 60 (continued)

Data	Teacher Three	Teacher Six
	. Decreased percentage of thoughts in sub-categories "student selection" and "evaluation of strategies" after in-service.	
Instructional Strategies - Classroom Management & Control (Tables 28, 29)	. Decreased percentage of thoughts in this category post in-service (b). . Decrease in awareness of need for control after in-service. . Increased reference to evaluation of control strategies after in-service. . Increased proportion of thoughts concerning the organization of the class or lesson after in-service.	. Decreased percentage of thoughts related to control strategies at post in-service (b). . Parallel increase in thoughts reflecting concern for control in final phase. . Over period of the study, decreased proportion of thoughts pertaining to organization of classroom or lesson.
Instructional Strategies - Lesson Content (Tables 30, 31)	. Both teachers reported reduced proportion of thoughts in this category after in-service. . No systematic change in substantive components.	
Perceptions (Tables 32, 33)	. No systematic change	. Increased proportion of thoughts in this category after in-service. . Increased awareness of classroom noise at post in-service (b).

Table 60 (continued)

Data	Teacher Three	Teacher Six
Interpretations (Tables 34, 35)	. Decrease in thoughts concerning pupil feelings after in-service; reversal at post in-service (b) to higher than initial level.	. Increase in proportion of thoughts over period of the study. . No change with regard to substantive components.
Pupil Information (Tables 36,37)	. Increased proportion of thoughts related to academic performance after in-service. . More consistent reference to pupil personality after in-service.	. Increased reference to previous classroom behavior after in-service . Decrease in thoughts related to academic ability of pupils after in-service.
Feelings (Tables 38 - 43)	. Increased anxiety after in-service	. No systematic change in feelings reported.
Self Awareness (Tables 44, 45)	. Decreasing proportion of thoughts in this category. . No systematic change in substantive components of this category.	. Increase in self awareness at post in-service (a) phase. . Post in-service (b) proportion of thoughts at pre in-service level. . Increased awareness of instructional evaluation at post in-service (a). . Increased awareness of personal preparation following in-service.
Beliefs (Tables 46, 47)	. No systematic change over phases of study in frequency of reference to beliefs.	

Table 60 (continued)

Data	Teacher Three	Teacher Six
Non-Task-Related Thoughts (Tables 48, 49)	. No systematic change in proportion of thoughts in this category.	
Macro-Analysis of Teacher Thoughts (Tables 50, 51)		
Teacher Monitoring		
i. Ecological factors (Table 52)	. No evidence of change in teacher monitoring of ecological factors.	
ii. Instructional strategies (Table 53)	. Doubling of reflections on instructional strategies after in-service. . Pupil selection more frequently addressed in total thoughts prior to in-service.	. Reduced reference after in-service to instructional strategies.
iii. Classroom management & control (Table 54)	. Increased reference to issues of management and control. . Increased reference to concern for control and discipline after in-service. . Increased reference to low-key approach to disruption after in-service.	. Increased reference to issues of management and control. . Increased reference to low-key approach to disruption after in-service. . Increased reference to non-verbal techniques after in-service.

Table 60 ((continued)

Data	Teacher Three	Teacher Six
iv. Teacher self monitoring (Table 55)	. Increased reference to use of circumvention after in-service. . Decreased reference after in-service. . Decreased reference to performance after in-service.	. Increased reference after in-service . Increase in frequency of reference to personal preparation after in-service.
Equality of Treatment (Table 56)	. Decreased reference to equality of treatment after in-service.	. No evidence of change.
Teacher Authenticity (Tables 50, 51)	. Infrequent reference after in-service.	. Consistent reference throughout study.
Teacher Empathy (Tables 50, 51)	. Evident most frequently prior to in-service.	. Increased reference after in-service.
Suppressing Emotions (Tables 50, 51)	. Decreased evidence after in-service.	. Consistent reference throughout study.
Cognitive Linking (Tables 50, 51)	. No change in evidence of cognitive linking.	. Greater evidence of cognitive linking before in-service.
Rules (Tables 50, 51)	. Increased reference to rules after in-service.	. Less consistent reference after in-service, however, greatest

Table 60 (continued)

Data	Teacher Three	Teacher Six
		frequency of reference for any one protocol occurred after in-service.
Beliefs (Tables 50, 51)	. No systematic change in reference to beliefs observed.	
Case Histories (Tables 50, 51)	. Extensive reference in all protocols. No evidence of systematic change.	

CHAPTER VI

SUMMARY AND DISCUSSION OF RESULTS

The purpose of this chapter is to synthesize the results of the study presented in Chapter V and to relate these to the research questions addressed in the study. These research questions were:

1. To what extent and in what manner do the interactive thought processes of teachers change as a result of a planned intervention program?
2. To what extent and in what manner do teachers' overt classroom behaviors change as a result of a planned intervention program?
3. To what extent are changes in the interactive thought processes of teachers translated into changes in a teacher's overt classroom behavior?
4. To what extent and in what manner do the preactive thoughts of teachers change as a result of a planned intervention program?
5. Is there evidence that teacher behavior or teacher thought patterns change as a result of stimulated recall?

The results relevant to each question will be presented and discussed separately.

Question 1: To what extent and in what manner do the interactive thought process of teachers change as a result of a planned intervention program?

In order to capitalize fully on the richness and complexity of the data contained in the stimulated recall protocols the interactive data were analyzed by means of content analysis. Following this the protocols were analyzed globally for the purpose of identifying phenomena which characterize the total thoughts of the teachers contained in the protocols and which are perceived to represent the broader contextual framework within which the interactive thoughts are located. It was considered important to look for evidence of change or stability in the larger context when addressing the issue of change in interactive thoughts, for stability in the broader framework could be expected to be manifest in stability, over time, in interactive thinking.

Analysis of the protocols revealed a degree of congruency in the kinds of information processed by the two teachers during the interactive phase of teaching. Categories with high percentage frequencies and those with low percentage frequencies tended to be the same for both teachers. Similarly with the frequencies with which the phenomena were identified in the total transcripts.

In synthesizing the results related to Question 1 the following approach will be adopted. Each category of thought identified by the content analysis system and each phenomenon identified by the macro-analysis will be described briefly and an overview of change which occurred in each during the course of the study will be presented. Detailed description of the changes has been provided in Chapter V.

MICRO-ANALYSIS OF INTERACTIVE THOUGHTS

Instructional Strategies - Methodology

This category contained interactive thoughts which had as their focus instructional aspects of the lesson related to teaching techniques and strategies. That the single greatest proportion of interactive thoughts reported by both teachers was accounted for by this category reflects the prevalence with which the teachers considered the strategies they were employing, evaluated the effectiveness of the strategies and contemplated alternatives. Thoughts related to pupil selection and the monitoring of learning behavior were also substantive components of this category.

On the basis of the data collected in this study one can only speculate as to whether the percentage of interactive thoughts reported in this category reflected usual information processing by the teachers or whether the teachers were sensitized to this aspect of the teaching process through their involvement in the larger study. In this study the teaching processes which normally occur within the privacy of the classroom were the subject of observation by both the researcher and coder.

With both teachers a consistently high proportion of interactive thoughts was classified in this category throughout the study. While there is no evidence of systematic change in this regard with Teacher 6, a perceptible though not marked increase is evident with Teacher 3. With regard to the substantive components of the category, Teacher 3 reported a greater proportion of thoughts concerning actual teaching strategies after the in-service experience, a change which was paralleled by a decrease in evaluative thoughts regarding strategies.

It should be noted that of the teaching strategies comprising the in-service program the majority addressed methodological issues.

Instructional Strategies - Classroom Management and Control

Thoughts related to the organization, management and control of the learning environment accounted for the second largest proportion of interactive thoughts of both teachers. As with the previous category it is not possible to determine whether this high proportion reflected heightened awareness consequent upon the teachers' involvement in the larger study.

Data contained in the subcategories indicate that while the teachers considered strategies related to the organization of the teaching space and the conduct of the lesson the greater proportion of thoughts concerned the need for control and control strategies. An organizational issue which impinged on the interactive thoughts of both teachers with a notable degree of consistency was awareness of time. This served to impact teaching strategies and classroom behavior.

Both teachers reported a relatively uniform proportion of interactive thoughts in this category, with little evidence of systematic change as a result of the planned intervention program, although for Teacher 3 a reduced percentage of thoughts occurred in this category at the post in-service (b) phase.

Consideration of the substantive components of the category highlights the risk that evidence of change can be masked by the use of single broad categories. After the in-service program Teacher 3 reported heightened awareness of organizational moves and strategies and more consistent evaluation of control strategies. Reduced concern over the need for control was reported.

Although over the duration of the study a decreasing proportion of Teacher 6's interactive thoughts pertained to the organization of the classroom or of the lesson the change was not coincident with the intervention program. Change was apparent however in the post in-service (b) phase of the study when thoughts concerning the need for control increased while concern over control strategies decreased.

Issues of management and control constituted a significant element of the in-service program.

Instructional Strategies - Lesson Content

Interactive thoughts in this category related to the substance of the lesson and included reference to the curriculum, materials, resources and goal statements. With both teachers a reduced proportion of thoughts was reported in this category after the in-service experience.

Perceptions

Thoughts reflecting sensory awareness of such aspects of the classroom environment as classroom noise, pupil workstate, pupil verbal and non-verbal behavior and awareness of the presence or absence of pupils represented a significant component of each stimulated recall protocol. Over the period of the study the proportion of Teacher 3's interactive thoughts accounted for by this category did not change systematically, however, after the in-service program Teacher 6 evidenced increased awareness of the classroom environment, particularly awareness of classroom noise in the post in-service (b) phase.

In monitoring classroom events the teachers attended selectively to stimuli in order to simplify the task environment and prevent information overload. More commonly Teacher 6 reported attending to verbal behavior and classroom noise whereas Teacher 3 reported awareness of pupil movement, posture and expressions and work activity.

Teacher awareness of the classroom environment was addressed explicitly in Teaching Strategies 2 and 24 and implicitly in others.

Interpretations

The third most commonly reported category of interactive thoughts related to inferences made by the teachers concerning their perceptions. The teachers placed interpretations on a variety of pupil behaviors including academic performance, motivational state, cognitive processes and affective state. These inferences provided a context or basis for subsequent teacher actions.

With regard to this category the data contains no evidence of systematic change related to the timing of the in-service program, however, over the duration of the study Teacher 6 reported a discernible increase in the percentage of thoughts in the category.

With regard to the substantive components, immediately following the intervention program Teacher 3 reported a decreased proportion of thoughts related to inferences regarding pupil feelings. This situation was reversed at the post in-service (b) phase of the study where the proportion of such thoughts was higher than the pre in-service level.

Pupil Information

Both teachers used pupil information which had been acquired prior to the lesson as part of their information processing and as a basis for interaction. They reported interactive thoughts related to pupil personality, academic ability and previous academic performance, classroom and social behavior and general information about the pupil such as history of absences, interests and family background. This reflected the extensive inventories of information that teachers carry around in their heads concerning their pupils. This information is used as a basis for making inferences about pupil behavior, as a basis for individualizing approaches to the pupils and as a basis for the instructional strategies used with the pupils.

The proportion of thoughts related to pupil information displayed a general stability over the major phases of the study, although Teacher 3 reported an increased proportion of interactive thoughts concerning pupil personality and previous academic performance after the intervention program. Teacher 6 made greater reference to previous classroom behavior but reported a reduced proportion of thoughts related to academic ability after the in-service program.

Feelings

Thought units in which the teachers recalled experiencing emotions or reactions were recorded in every protocol, and represented a relatively consistent though small proportion of the thoughts throughout the study. The feelings reported by the teachers included anxiety, frustration, pleasure, surprise, guilt, humor, unconcern and indifference.

There is no evidence of a systematic change in the percentage of thoughts in this category over the course of the study although Teacher 3 expressed a generally higher level of anxiety after the in-service program. This anxiety peaked in the post in-service (b) phase.

Despite the reported emotions and reactions experienced interactively by the teachers, teacher feelings did not commonly find expression in overt behavior. This could be accounted for in part by the phenomenon of Suppressing Emotions, or by "teachers' efforts to keep emotions as an inner experience and to allow them infrequent overt expression" (Marland 1977:208).

Self Awareness

Thoughts which indicated that the teachers were aware of themselves in the learning environment and that they monitored and evaluated their instructional behavior represented a relatively small though constant proportion of interactive thoughts. Primarily such self awareness focused on evaluation of classroom performance, although reflection on personal characteristics such as personality, appearance and teaching style was reported. Reference was also made to personal preparation and background knowledge. Both teachers reported interactive thoughts concerning awareness of their physical location in the teaching space.

While over the course of the study Teacher 3 reported decreased self awareness, Teacher 6 reported heightened self awareness after the in-service experience. This increased awareness centered specifically on instructional evaluation and consciousness of lesson preparation. It should be noted that throughout the study this category accounted for a larger proportion of the interactive thoughts of Teacher 6 than of Teacher 3 suggesting an initially higher level of sensitivity to the issue on the part of Teacher 6.

With regard to self awareness the relative impact on Teacher 6 of the in-service program and of self confrontation resulting from stimulated recall is open to conjecture.

Beliefs

A small proportion of the teachers' interactive thoughts reflected general and pedagogical beliefs which served to influence classroom behavior. In the main these beliefs were implied rather than stated explicitly and were couched in non-technical vocabulary.

The majority of the beliefs alluded to in the protocols were related to pedagogical issues.

Interactive reference to beliefs was not impacted by the in-service experience. While the issue of teacher beliefs was not directly addressed in the in-service program, one would speculate that exposure to the thirty one teaching strategies would have impacted the teachers' interactive reference to beliefs unless the in-service experience was perceived as being inapplicable to their individual needs. Comments by the two teachers suggest that the substance of the in-service program was not new to them and perhaps had already been accommodated within their thinking:

> T3.10: I think it's a good reminder after being away from the university for some time.
>
> T6.10: I'd say those things would be good for a student teacher who'd have to change a whole lot of things

Non-Task-Related Thoughts

Interactive thoughts which were unrelated to the events of the lesson were reported by both teachers and included awareness of the investigator, reaction to interruptions and general off-task thoughts.

Teacher 6 reported a higher proportion of such thoughts than

Teacher 3 of which a greater proportion were thoughts related to general non-concurrent events. There is no evidence of systematic change in the proportion of thoughts in this category as a result of the intervention program.

Table 60 summarizes the changes which were identified in the interactive thought processes of the two teachers on the basis of the content analysis system developed for this study. From this table it is evident that with regard to the categories, neither widespread nor systematic change occurred which could be attributed to the intervention program. Only in two categories (Instructional Strategies - Lesson Content, and Self Awareness) did the interactive thinking of both teachers change and of these only in the former was the change in the same direction for both teachers.

Change within the substantive components of the categories was more widespread. This fact highlights the function served by subcategorization and the danger that broader categories can serve to mask change.

The change which occurred within the substantive components does not reflect systematic impact on either teacher individually, or on both teachers. Change does not appear to have occurred in cognate areas.

The significance of the time which elapsed between the post in-service (a) and post in-service (b) observations is suggested by those occasions when change was not maintained or occurred in the opposite direction at the post in-service (b) phase. The impact of this month will be discussed fully when changes in overt behavior are considered.

MACRO-ANALYSIS OF TEACHER THOUGHTS

While Question 1 specifically addresses the issue of change in the interactive thought processes of teachers, after analysis of the protocols it was considered important to look for evidence of change or stability in the broader context within which the interactive thoughts were located. This was attempted through identification of the phenomena which characterize the total thoughts reported by the teachers and by looking for evidence of stability or change in these over the duration of the study. Such data would provide a context within which to interpret stability or change in the interactive thoughts.

Identification of change with respect of the phenomena was treated cautiously as comments within the protocols suggested that with regard to non-interactive thoughts the teachers viewed the stimulated recall sessions as ongoing rather than discrete events. This lead the writer to hypothesize that non-interactive thoughts articulated in one session may not be repeated in a subsequent session. Hence a decrease in the frequency with which thoughts related to a particular phenomenon are reported may not indicate a change in the information being processed but rather a reluctance to restate a previously amplified position.

Teacher Monitoring

A significant phenomenon of the total thoughts of both teachers was a pervasive awareness and monitoring of features and conditions prevailing in the learning environment. Teacher thoughts reflected constant monitoring of ecological or environmental factors, instructional strategies, classroom management and control and self in the classroom milieu. Of these, thoughts related to the monitoring of classroom management and control were the most frequently and consistently reported.

Ecological factors. With regard to the monitoring of ecological factors there was no evidence of change in the teachers' thoughts over the period of the study. The consistent concern for time noted in the interactive thoughts is reflected also in the total thoughts.

Instructional strategies. Monitoring of the impact, appropriateness and effectiveness of instructional strategies was reflected in the thoughts of both teachers. While over the course of the study there was no systematic change with which Teacher 3 referred to the monitoring of instructional strategies, this teacher reflected on strategies with greater frequency after the in-service program; a situation which is reflected in the change identified in Teacher 3's interactive thoughts.

It was with reduced frequency that Teacher 6 referred to and reflected on instructional strategies after the in-service experience. The interactive thoughts of this teacher also indicated a decrease in interactive monitoring of the instructional aspects of the lessons after the in-service program.

Student selection was more frequently addressed in the total thoughts of Teacher 3 prior to the in-service program, a feature similarly reflected in the analysis of interactive thoughts.

Instructional strategies comprised a significant component of the intervention program, the impact of which on Teacher 3 appears to be heightened awareness of instructional strategies, whereas with Teacher 6 thoughts reflecting awareness or monitoring of instructional strategies were reported less frequently after the in-service program.

Classroom management and control. A further aspect of teacher monitoring related to the teachers' awareness and monitoring of pupil motivation, on-task activity and classroom behavior, as well as evaluation of management and control strategies. The teachers attended to such cues as inattention, restlessness, noise level and quality of work.

Reference to issues of management and control was made with greater frequency by both teachers after the in-service experience and Teacher 3 reported greater awareness of and concern for control and discipline following the in-service program. This teacher's interactive thoughts evidenced a decrease in concern for need for control over the same period.

The protocols of both teachers contained increased reference to a low-key approach to disruption after the in-service experience. This was the subject of Teaching Strategy 3.

Self monitoring. The protocols of both teachers contained thoughts which indicated that the teachers consciously monitored their own classroom behavior, addressing such issues as performance, preparation and self image.

Teacher 3's thoughts indicated heightened consciousness of self prior to the in-service experience with greater concern centering on personal performance in that period. The interactive thoughts of this teacher which reflected self awareness also decreased over the course of the study.

Teacher 6 reported more frequent thoughts concerning self monitoring after the in-service program with increased reference to lesson preparation. This situation is mirrored in the teacher's interactive thoughts.

Equality of Treatment

Pervading the protocols was implicit and explicit evidence that the teachers' classroom behaviors were influenced by a predisposition to treat all pupils equally. Conners (1978) identified this as the Principle of Equality of Treatment. This phenomenon impacted pupil selection and questioning, deployment of teacher time and the monitoring of pupil work.

Despite this orientation both teachers recognized occasions when they consciously and purposefully differentiated between pupils. This differential treatment was in response to perceived needs or problems such as the need to develop some aspect of personality, the socialization of a pupil into the classroom routine, or compensation for perceived disadvantages.

Reference to substantive components of this phenomenon was made in every protocol by both teachers, with Teacher 3 recording more frequent reference before the in-service experience to the concept of equality of treatment and also to willingness to differentiate and individualize treatment.

The relative consistency with which reference was made to this phenomenon throughout the study indicates its importance as an element of the teachers' educational philosophies. One would postulate that this phenomenon would continue to impact pupil selection despite Teaching Strategy 19 which advocated restricting the selection of volunteers.

Teacher Authenticity

This dimension of the teachers' role conception presents the teachers' human qualities. It is perceived as providing a basis for trust and understanding, portraying the teacher as an available and approachable person.

Of the references to this phenomenon by Teacher 3 most occurred prior to the in-service experience. Teacher 6 recorded more consistent and more frequent reference to this phenomenon than did Teacher 3, with increased reference by Teacher 6 evident after the in-service experience.

Although the issue of teacher authenticity was not directly addressed in the in-service program one would speculate that exposing teachers to the consideration of such topics as persuasiveness, warmth and empathy would impact the larger concept of the role of the teacher.

Teacher Empathy

This reflected the teacher's concern and caring for, understanding of, and sensitivity to pupil feelings and interests. It is based on a sense of respect and valuing and reflects awareness of the pupil's affective state and includes measures adopted by the teacher to protect pupil self-concepts and feelings.

Each protocol of Teacher 6 contained evidence of this phenomenon with increased reference apparent after the in-service program. Over the course of the study Teacher 6's interactive thoughts concerning perceptions displayed a similar trend with more consistent reference to pupil feelings being evidenced after the in-service experience.

The most frequent reference by Teacher 3 to this phenomenon occurred before the in-service experience with infrequent reference occurring after that event. Analysis of Teacher 3's interactive thoughts indicates a decrease in interpretations related to pupil feelings following the in-service program.

Teaching Strategies 30 and 31 addressed the topics of warmth and empathy.

Suppressing Emotions

This phenomenon involved the suppression and masking of teacher feelings from the class, and while it commonly occurred in reaction to pupil misbehavior and off-task activity it was also evident as a control strategy. The teachers reported withdrawing from emotionally disturbing situations to minimize disruption and of suppressing their own reaction to avoid inflaming negative pupil response. The technique was also used as a means of protecting their own personal feelings.

Thoughts reflecting this phenomenon were more commonly expressed by Teacher 6, however there is no evidence of systematic change in the thinking of this teacher in relation to this phenomenon over the period of the study.

There is decreased evidence of this phenomenon in the thoughts of Teacher 3 after the in-service program.

Cognitive Linking

Teachers do not perceive lessons in isolation from preceding or proposed events but process information which links the current lesson to past and future lessons. Instructional and control strategies were adapted on the basis of information recalled from previous lessons.

The in-service experience does not appear to have impacted this aspect of Teacher 3's thinking. Teacher 6's thoughts contained greater evidence of cognitive linking before the in-service program.

Rules

The rules reported in this study referred to organizational features of classroom life and were designed to enhance and facilitate management and control.

While classroom rules were alluded to with greater frequency by Teacher 3 after the in-service program which had actively promoted the instituting of procedural rules, Teacher 6 referred to them less consistently after that experience.

Beliefs

Revealed in the total thoughts of the teachers were general and pedagogical beliefs which guided teacher behavior during instruction. The data suggest that the belief structures of the teachers were not impacted by the in-service program. This was also the finding with regard to interactive reference to beliefs.

Case Histories

Extensive reference was made in all phases of the study to information carried in the heads of the teachers relating to pre-lesson knowledge concerning pupils. These data constituted a significant component of teacher information processing and formed a basis for interaction, serving to mediate teacher classroom behavior.

The case histories elaborated upon in the non-interactive situation were more detailed and extensive than the pupil information recalled in their interactive thoughts.

The significance of this phenomenon is connoted by the consistency with which case histories were referred to in all phases of the study, a situation also reflected in the interactive thoughts of both teachers.

The phenomena identified through macro-analysis of all thoughts contained in the stimulated recall protocols are conceived as representing the broad context within which interactive thoughts are located. As such these phenomena establish parameters within which change in interactive thinking can occur.

From Table 60 which summarizes the changes which occurred in the phenomena characterizing the total thoughts of the teachers it is evident that while change was somewhat more widespread it was no more systematic than in the interactive thoughts of the teachers.

A striking feature of the change which did occur is the difference with which the thoughts of the two teachers appear to have been impacted over the course of the study. With Teacher 6 the changes were reflected in greater reference to the phenomena after the in-service program whereas with Teacher 3 greater reference occurred in the pre in-service phase of the study. This suggests:

1. this teacher was reluctant to reiterate non-interactive thoughts expressed in a previous stimulated recall interview. Evidence was presented in Chapter V which indicated that the teachers considered the stimulated recall interviews as ongoing rather than discrete events;

or 2. this teacher experienced heightened sensitivity to features of the teaching process in the initial phase of the study through;

i. involvement in the larger study,

ii. participation in this study,

iii. the presence of the researcher and coder in the classroom.

These singly or in combination may have resulted in a Hawthorne Effect which served to make the teacher more conscious of features in his own teaching behavior and in his environment. The post in-service situation may reflect the usual situation.

Question 2: To what extent and in what manner do teachers' overt classroom behaviors change as a result of a planned intervention program?

The change which was observed in the overt classroom behavior of the teachers has been detailed in Chapter V. Discussion in this section will focus on the features of the change which was identified. In so doing, change will be viewed from the perspective of the teaching strategies which comprised the substance of the intervention program.

Implicit in the discussion of change in the classroom behaviors of the teachers is the assumption that change determined on the basis of comparison of subsequent codings on the Observation Schedule accurately portrays the actual change which occurred.

From the data presented in Chapter V and summarized in Table 60 it is apparent that the change in overt teacher behavior over the period of the study was both widespread and complex although change was not evident in all facets of teacher classroom behavior. The teachers' use of the learning space, pupil grouping, the utilization of instructional materials and teacher planning do not appear to have been impacted by the intervention program.

Low Inference Data

On the basis of the low inference data change was identified in relation to teacher-pupil interaction. With regard to question type Teacher 3 asked a reduced proportion of product questions in language arts and in the total lessons after the in-service program. In both cases, however, the proportion increased at the post in-service (b) phase and was higher than the pre in-service level. After the in-service program the proportion of product questions posed by Teacher 6 in mathematics increased. At the post in-service (b) phase, one month later, the proportion of product questions observed in language arts and the total lessons for Teacher increased, while in mathematics a decrease was recorded.

These changes should be interpreted in light of the high inference ratings on Teaching Strategy 21 (Variable 18, Table 16) where Teacher 3 was assessed as using a more appropriate mixture of high and low order questions at each phase of the study. Teacher 6 was judged to use a less appropriate mixture in both subject areas after the in-service program. This suggests that change should be evaluated not only in relation to the relevant teaching strategy but also giving due regard to the situation in which it occurred.

The basis of pupil selection changed over the course of the study. Teaching Strategy 19 advocated limiting the selection of volunteers to 10 to 15 percent of student choices. In language arts the percentage of volunteers selected by both teachers increased after the in-service program and increased still further at the post in-service (b) phase.

Pre-selection was the common basis for pupil selection in mathematics. Teacher 3 increased the percentage of pupils pre-selected both after the in-service program and again after one month. Following the in-service experience the percentage of pupils pre-selected by Teacher 6 decreased, however this trend was reversed at the post in-service (b) phase where the level of pre-selection was considerably higher than at the pre in-service phase. For the same teacher the percentage of "call-outs" accepted doubled after the in-service program, but had decreased dramatically in the final period of observations.

It is significant to note the different basis for pupil selection in the two subject areas, which suggests that the teachers perceived a difference in this element of their instructional strategies relevant to the two subjects.

The impact of the intervention program on teacher behavior with regard to pupil selection should be considered in the context of the teachers' thoughts, for these indicate the extent to which the attitudes or underlying philosophies of the teachers are likely to circumscribe change. Macro-analysis of the protocols revealed the complex information processing involved in pupil selection. Both teachers reported multifarious reasons to support their practices with regard to pupil selection, among which were an orientation to provide opportunity for all pupils to respond; provision of encouragement and reinforcement; achievment of greater pupil involvement; monitoring of instructional strategies and control techniques.

The complex information processing involved in pupil selection is implied in the following statement by Teacher 6:

> T6.3: If I want a right answer there are people I'll ask, if I want it right away. If there are people I want to test there are other people I'll ask. Sometimes I won't really want to ask somebody, that particular person, because I know I'm going to get a wrong answer, but yet I'll ask them anyway; it depends on how much patience I've got at that moment or what the situation is. If I feel we're holding up the class then I'll probably avoid asking them.

To effect change with regard to pupil selection the intervention program had to impact deep rooted and well established practices such as those implied in this statement.

The use of praise to reward and encourage, and the use of mild criticism to convey expectations was advocated in the intervention program as means of affecting pupil achievement. With regard to these two strategies minimal impact was recorded in the low inference data on the overt behavior of Teacher 3. With Teacher 6, while the use of praise increased after the in-service program no praise was observed at the post in-service (b) phase.

Based on subjective assessments of teacher behavior during entire lessons, as contrasted to the three minute "snap shots" provided by the T.M.O. (Appendix D), Variables 29 and 30 (Table 16) revealed somewhat greater evidence of change. Teacher 3 displayed decreased evidence of both praise and criticism in language arts whereas with mathematics the use of praise and criticism increased. In language arts Teacher 6 used less praise and more criticism in each phase. In mathematics the use of criticism declined after the in-service program and was not observed at the post in-service (b) phase.

The mean ratings for both teachers involved in this study on the use of praise and criticism were lower than the mean ratings of the total group of Grade Three and Grade Six teachers in the quasi-experimental study.

Reference to the two teachers' thoughts provides some insight into their use of praise and criticism. Teacher 3 reported:

> T3.3: I think perhaps I should use more [praise] than I do; but if I remember I try to use it . . . . I try to reinforce their good behavior.

In view of this perceived need and heightened awareness one would have hypothesized that the teacher's use of praise would have increased after the in-service program.

> T3.5: I thought I should use every opportunity I can to praise a child to reinforce him for some work he's done because it might be the only opportunity during the day that I'll hear him.

This statement implies that the teacher perceived himself as using praise generously. The disparity between his perception of his actions and those observed by the coder exemplify the distinction drawn by Kaplan (1964) between act meaning (the meaning of the act to the actor) and action meaning (the meaning of the act to the observer).

Even after the intervention program Teacher 6 was oriented to a restricted use of praise. This was evidenced in his overt behavior and supported by statements in the protocols.

> T6.6 . . . I don't give a lot of reinforcement. My feelings are that you get reinforcement when you deserve reinforcement . . . . I try to be encouraging when it's deserved, but on the other hand if someone only gets 50 percent I don't go overboard and praise them . . . I don't try to overdo praise. I think it can be overdone.

> T6.9: . . . over used [praise] begins to mean nothing.

Of criticism Teacher 6 reported "I don't use it a lot and I try not to use it at all."

These statements indicate the strength of the internalized beliefs of the teachers.

A striking change occurred during the study in terms of the nature of teacher feedback following a pupil's response. With the exception of language arts where Teacher 3 increased the proportion of sustaining feedback throughout all phases of the study, both teachers were observed to provide a reduced proportion of sustaining feedback after the intervention program. This situation was reversed at the post in-service (b) observations where the proportion in all cases approximated the pre in-service level. This situation is also reflected in the high inference data (Variable 28, Table 16).

High Inference Data

The high inference data which required the coder to make subjective assessments on the basis of observation of entire lessons confirmed the extent and complexity of the change which occurred in the classroom behavior of the teachers. Each teacher was assessed on thirty one variables in both language arts and mathematics, resulting in a total of 124 teacher-subject-variables. Of these, after the in-service program, fourteen registered a significant (defined as a change equal to or greater than 0.5 on the five-point scale) positive change, and thirty nine a significant negative change (Table 17). Between the post in-service (a) and post in-service (b) phases of the study the direction of change reversed, with significant positive changes (fifty) outnumbering significant negative changes (sixteen). Over the duration of the study, that is, from pre in-service to the post in-service (b) phase, significant positive change (forty five) was greater than significant negative change (twenty).

In approximately half of the cases where change was identified, the direction of change observed after the in-service program had reversed at the post in-service (b) phase.

Analysis of the high inference data of the larger study indicated that on twenty five behaviors significant change occurred after the in-service treatment.

From the data several features of the change in the overt behavior of the teachers became apparent.

1. While change in overt behavior was widespread the initial change observed after the intervention program was not always maintained.
2. Initial change was frequently in the direction opposite from that advocated in the teaching strategy. Observations after a further month revealed a higher incidence of change consonant with the strategies. In many instances the latter change served to offset the initial change such that the classroom behaviors observed in the final phase approximated initially observed behavior.
3. Change was adopted into a subject context rather than generally adopted into the teacher's repertoire of teaching skills.
4. Change was not evidenced in cognate areas, but rather appears to have been unsystematically adopted.

The impact of the time lapse between the observations immediately following the intervention program and those one month later warrants investigation. Why did such significant, complex and widespread change occur over this period? The following suggestions may account for the phenomenon and/or serve to direct subsequent investigation.

1. The month represented a period of in-class appraisal and reflection in which the teacher, operating in his usual environment unthreatened by the presence of either the coder or researcher, was free to accomodate or assimilate the advocated teaching strategy into his repertoire of teaching skills, or to reject it.
2. Where the in-service experience served to sensitize the teacher to an awareness that his classroom practices were not in accord with research findings his post in-service (a) performances may have reflected change simply due to this awareness of this discord and the internal conflict it generated. In the following period the teacher may have resolved the conflict by rationalizing his teaching behavior in terms of other variables deemed pertinent and so the observed behavior at that point approximated pre in-service behavior.
3. Where the in-service experience interfered with established classroom practices, the interference may have been reflected in;
   i. maintenance of pre in-service practices after the in-service program until the teacher had opportunity to observe the impact of modified behavior on the basis of perceived classroom reinforcement. Rejection of the need to change his behavior may have been evidenced by a reaction against the strategy at the post in-service (b) phase.

   ii. decreased utilization of the strategy immediately following the in-service course while the teacher sought to interpret the new position within the rubric of his educational philosophy.

4. Having been acquainted with research-based evidence for change, the teacher may have used the period immediately following the intervention program to evaluate the impact of his own classroom practices before embracing change. Change therefore may have become apparent at the post in-service (b) phase.
5. At the pre in-service and post in-service (a) phases three lessons in both subject areas were coded for each teacher to furnish the data on overt teacher behavior. At the post in-service (b) phase, however, only one lesson in each subject area was observed which means aberrant teacher behavior in those lessons would serve to compound change because the mean rating of each behavior in the earlier phases would mediate extremes of behavior in any one observation situation. Lesson descriptions in Appendix H do not contain evidence of uncharacteristic behavior to indicate that the change identified in the final phase was due to this design feature.
6. The tendency of observers to change the manner in which they apply the definitions of behavior over time is identified by Kazdin (1977). The intercoder reliability computed in the final phase, and reported in Chapter IV indicates that this would not account for the observed change.

At the conclusion of the final stimulated recall interview both teachers were asked for their perception of the impact of the in-service program on their classroom behavior. Their replies;

> T3.10: I try not to verbalize as much in discipline and I'm trying to use more eye contact and silent methods of discipline.
>
> T6.10: . . . I guess it changed me because there are things that I remembered that, "Hey this is what I should be doing."

indicate that the teachers themselves did not perceive a major impact on their classroom practices.

Question 3: To what extent are changes in the interactive thought processes of teachers translated into changes in a teacher's overt classroom behavior?

In the presentation of data in Chapter V detailed variations in both the covert thoughts and overt behaviors of the teachers were described. For this reason this section will focus on relatively broad areas of change. In so doing the discussion will not be predicated on the notion that the change was necessarily contiguous with the intervention program.

It should be noted, for reasons previously discussed, that the categories of interactive thought do not closely reflect the teaching strategies which comprised the intervention program. This characteristic will serve to impede direct comparison of changes in thought with overt behavior.

Discussion in this section will focus on interactive thoughts, but where appropriate these will be cast in the larger framework of the total thoughts reported in the protocols.

Instructional Strategies - Methodology

In the total thoughts of Teacher 3 there was no significant change in the frequency with which thoughts concerning the monitoring of instructional strategies were reported, although there was increased reflection on strategies. This concern for strategies was evidenced also in the teacher's interactive thoughts related to teaching techniques.

Changes in overt classroom behavior which could be conceived as being related to the changes in thought processes in this category included:

i. a change in the basis of pupil selection. This was subject area related.
ii. a changed proportion of sustaining responses; also subject area related.
iii. increased monitoring of seatwork.
iv. increased variety of instructional techniques.

The priority given to teaching strategies in lesson planning remained consistently high, although after the in-service experience concern for objectives was reported as the first planning decision taken.

The total thoughts and the interactive thoughts of Teacher 6 contained no evidence from which to infer general change in the proportion of thoughts concerning instructional methods. Substantive components within the broader category however reflected change.

The total thoughts of this teacher contained less frequent reflection on instructional strategies after the in-service program, although this characteristic was not apparent in the interactive thinking of the teacher. This situation adds support to the hypothesis developed in this study that with regard to non-interactive thoughts teachers may avoid repeating a view, opinion or belief in a subsequent interview. This suggests the need for caution in interpreting an apparent decrease in the frequency of non-interactive thoughts as indicative of a change in thinking.

While the interactive thoughts reported by Teacher 6 regarding teaching strategies and methodology were assessed as not having changed, and the total thoughts indicated decreased attention to these issues, teacher behavior in the same areas as those previously identified for Teacher 3 did change:

i. there was a change in the basis of pupil selection. As with Teacher 3 the change was related to the subject area of the lesson.

ii. the proportion of sustaining responses decreased after the in-service program, only to return to the initial level at the post in-service (b) phase.

iii. monitoring of seatwork decreased after the in-service program, to increase at the post in-service (b) phase.

iv. the variety of instructional techniques employed decreased after the in-service experience, and although they were perceived to rise in the final phase of the study they remained significantly lower than the mean for the Grade Six teachers in the larger study.

The significant issue arising from the change in behavior of Teacher 6 is that it appears unrelated to a change in interactive thought processes.

Instructional Strategies - Classroom Management and Control

Increased concern over management and control was expressed in the protocols of the two teachers. Also contained in the total thoughts of both teachers was increased reference after the in-service program to specific issues of management and control related to the avoidance of disruption and the handling of disruptive situations in a low-key manner. Ratings for the teachers on this teaching skill indicated that both adopted this strategy into a subject area context and not into their total repertoire of teaching skills.

While there was no change in the proportion of interactive thoughts accounted for by this category, the proportion of thoughts in some of the substantive components reflected change. Both teachers changed with regard to the proportion of thoughts concerning the organization of the class or the lesson; Teacher 3 reporting an increased proportion and Teacher 6 a decreased proportion over the period of the study.

Included among the classroom behaviors which could reflect the change in interactive thoughts in this area are those related to:

i. classroom layout and grouping. Teacher 6's use of the learning space did not change; however, Teacher 3 reorganized the seating to form an additional row of desks.

ii. adoption of a system of rules to allow pupils to attend to personal and procedural needs. In the rooms of both teachers there was decreased evidence of the use of such rules after the in-service program. This trend was reversed at the post in-service (b) phase.

iii. the use of a system of rules to facilitate pupil independence in learning tasks. Increased evidence of the operation of such rules was apparent in both classrooms.

iv. the optimization of academic learning time. Over the period of the study both teachers were rated as using management skills to effect greater optimization of academic learning time. In language arts this was achieved only after an initial decrease following the in-service experience.

v. the use of a standard signal to gain pupil attention. A pause by the teacher was a more commonly adopted strategy for gaining or regaining pupil attention over the duration of the study.

vi. the ability to attend to several issues in the learning environment concurrently. Both teachers were rated as exhibiting greater evidence of this capacity, although for Teacher 6 this related only to mathematics. His "overlappingness" (Kounin, 1970) in language arts was assessed as having decreased during the study.

With regard to this substantive component of the category the interactive thoughts of the two teachers changed; one reflecting a greater proportion of thoughts and the other a reduced proportion over the period of the study. It is notable that despite this situation the overt behavior of both teachers on teaching skills conceived as reflecting this component of thought, paralleled one another in terms of change. The differences in interactive thinking were not translated into differences in overt behavior. Clearly this observation is based on the premise that the identified teaching behaviors reflect this aspect of teacher thinking.

Instructional Strategies - Lesson Content

Following the in-service program both teachers reported a reduced proportion of interactive thoughts concerning the content, materials and resources of the lessons.

Neither teacher displayed a systematic change in the use of instructional materials over the observed lessons, however, Teacher 3 did not report planning decisions related to lesson content after the in-service experience. Prior to that event, decisions concerning lesson content were reported as either the first or second planning decisions taken.

Throughout the study Teacher 6 reported the decision regarding lesson content as his first planning decision, despite the apparent change in interactive thinking.

The change in interactive thinking with regard to this category was manifest in the overt behavior of one teacher whereas it was not observed to impact the behavior of the other.

Perceptions

The proportion of interactive thoughts denoting sensory awareness of the learning environment did not change for Teacher 3; however, Teacher 6 evidenced increased awareness of such features prior to the in-service experience. This heightened awareness was maintained for the duration of the study.

Coder assessment of teacher awareness of what was occurring in the classroom revealed increased awareness on the part of Teacher 3. For Teacher 6 awareness in language arts was assessed as decreasing after the in-service program, while not changing in mathematics. In both subject areas increased awareness was perceived at the post in-service (b) phase. These findings further suggest a lack of congruence between change in interactive thinking and overt behavior.

Interpretations

Interactive thoughts reflecting the ascribing of meaning or explanation to perceptions constituted an increasing proportion of the thoughts reported by Teacher 6. This paralleled the previously identified increase in perceptions over the same period. However, as none of the measures of teacher behavior obtained in this study could be construed as reflecting teacher interpretations, it is not possible to infer whether this change in interactive thinking was translated into changed classroom behavior.

While the overall proportion of interactive thoughts of Teacher 3 accounted for in this category did not change, the proportion of inferences regarding pupil feelings decreased after the in-service program.

Assessment of overt behavior did not mirror this change, for the teacher was perceived to exhibit slightly greater evidence of caring, accepting and valuing of the pupils (warmth), and significantly greater accuracy of response to both obvious and less obvious meanings, feelings and experiences of the pupils (empathy).

Reference to the total thoughts of Teacher 3 indicates that on the phenomena of Equality of Treatment, Teacher Authenticity and Teacher Empathy, characteristics which implicitly involve cognizance of pupil feelings, the teacher reported less frequent thoughts after the in-service program.

By way of comparison and as a means of further highlighting the apparent lack of direct relationship between change in interactive thinking and change in overt behavior, attention is drawn to the interactive thoughts of Teacher 6 with regard to pupil feeling. While there was not a systematic change in the proportion of thoughts reported in this substantive component more consistent reference was made to pupil feelings. Whereas Teacher 6 was assessed as exhibiting greater "warmth" and "empathy" in mathematics, in language arts behavior reflecting these variables decreased following the in-service program, to increase at the post in-service (b) phase. The total thoughts of this teacher contained increased evidence of Teacher Authenticity and Teacher Empathy over the course of the study.

With regard to the other categories of interactive thinking identified in the study, no data concerning teacher classroom behavior were collected which would support inferences related to changes in interactive thinking being translated into changes in overt classroom behavior.

This discussion relevant to Question 3 serves to emphasize the fact that a complex relationship exists between the interactive thoughts of teachers and their overt classroom behavior. It is apparent that changes in interactive thinking are not necessarily translated into changes in overt behavior. Similarly, changes in overt behavior are not necessarily mirrored in changed interactive thoughts. These observations have validity only within the time frame of this study.

Question 4: To what extent and in what manner do the preactive thoughts of teachers change as a result of a planned intervention program?

As an element of the pre-instructional interview which preceded the videotaping of each stimulus lesson the teachers were asked to describe the phases they observed or considered in planning the lesson. They were also asked to identify the sequence in which the phases were addressed.

The teachers' statements with regard to their planning behavior were accepted by the researcher and no subsequent questions posed in order to avoid the inference that planning phases had been overlooked, or that the described behavior was inappropriate. The researcher activily sought to avoid influencing the teachers' planning decisions either by sensitizing the teachers to elements of planning before the in-service program or by reinforcing any aspect after that event.

From the planning phases identified by Teacher 3 (Table 22) it is evident that although this teacher reported considering a wide range of planning components, usually only three were addressed in any given lesson. The decisions most commonly involved in lesson planning related to:

1. teaching strategies, particularly motivation and lesson introduction;
2. learning activities;
3. lesson content;
4. materials and resources.

Most consistent reference was made to learning activities.

Concern for classroom control and management, identified in the interactive and total thoughts of this teacher, was reflected in the planning priority given to motivation, lesson introduction and learning activities. Evidence of this concern continued after the in-service program even though a systematic change in teacher planning was exhibited. From the second lesson after the in-service program the teacher consistently reported addressing lesson objectives as the first planning decision made. The reason for the timing of this change is unclear.

At the conclusion of the final stimulated recall session the teachers were asked whether their thinking changed due to their participation in stimulated recall. Teacher 3 reported:

> T3.10: I think it's really made me much more aware of my planning of my lessons . . . . I think I've been more aware of the objectives . . . .

However, when asked what he perceived to be the impact of the in-service program he stated:

> T3.10: I think I am much more conscious of my lesson planning.

The delay in identifying the consideration of objectives as a planning phase suggests that the in-service program did not profoundly impact teacher behavior. Moreover, if the change was due to the pre-instructional interviews the question is raised as to why the change was not effected earlier in the study. While the pre-instructional interviews may have served to sensitize the teacher to the treatment of lesson planning in the in-service program (Teaching Strategy 14), it would seem plausible to suggest that the in-service experience itself may have raised the consciousness of the teacher to his responses in the pre-instructional interview, culminating in either changed behavior or changed perception of previous behavior. The identical interview does not appear to have impacted the planning practices of Teacher 6 in the same manner.

Teacher 3 did not report considering diagnostic procedures in lesson planning nor was a high priority afforded evaluative techniques.

The preactive thinking of Teacher 6 involved only two facets of lesson planning, namely, content and teaching strategies. In only one lesson was this approach varied when the teacher reported making a decision concerning materials. This limited range of planning decisions may reflect the teacher's extensive use of prepared curriculum materials and teachers' manuals.

Within the stimulated recall protocols are both interactive and non-interactive references to awareness of lesson preparation or planning and the impact of this on the progress of lessons. Commonly these comments reflected dissatisfaction on the part of Teacher 6 with personal preparation and they increased in frequency after the in-service experience. This suggests that while the in-service experience resulted in enhanced awareness of planning the impact was insufficient to change the teacher's practices.

Broadly the planning practices reported by the two teachers conformed with those described by Taylor (1970), Zahorik (1975), and Yinger (1978).

Neither teacher made direct reference to pre-instructional planning in the stimulated recall interviews except indirectly or by implication. Reference was made to time in such a manner as to imply that the teachers had conceptualized a time framework within which to operate.

Both teachers functioned within the broad framework of their planning and evidenced the characteristic identified by Marland (1977) that the act of planning served to program the teacher to act in a predetermined way. Teacher reluctance to modify planning was demonstrated by Teacher 6, who even when faced with a claim by the pupils that a substitute teacher had already taken the lesson, was only prepared to effect minimal changes to the lesson plan he had articulated in the pre-instructional interview.

The degree to which the pre-instructional interview served to commit the teacher to a lesson plan cannot be determined other than by inference. During the above situation Teacher 6 reported the interactive thoughts:

> T6.4: I was trying to determine whether or not to go through with the lesson or to abort it altogether.

This suggests that the stance adopted by the interviewer in the pre-instructional situation had not denied the teacher the prerogative to effect whatever changes he deemed necessary in conducting the lesson or interfered with interactive decision making.

Question 5: Is there evidence that teacher behavior or teacher thought patterns change as a result of stimulated recall?

This significant methodological issue must be addressed if stimulated recall is to be employed in longitudinal studies designed to identify change in thought processes.

In order to ascertain the teachers' perceptions of the impact of stimulated recall on their thoughts and classroom behavior, at the conclusion of the final interview session the teachers were asked for their assessment. Both teachers reported being unaware of any conscious changes in their classroom behavior although both claimed that the experience had served to make them more aware of their interactive thoughts. This was not construed, however, to imply that their thoughts had changed.

Teacher 6 described the impact that self confrontation, which occurred as a concomitant feature of stimulated recall, had on him. He reported that his confidence had been shaken and expressed concern over the fact that he had not effected any change in his classroom behavior whereby his image as a teacher, as captured on videotape, was enhanced. That he, with some motivation to change, could not detect change suggests that conscious change in behavior had not occurred as a consequence of stimulated recall.

In view of the fact that these teacher reports represented a global and subjective view of change, evidence of specific change related to stimulated recall was looked for in the teacher process data and the protocols of the stimulated recall interviews. Because lessons were coded for the larger study which were not videotaped for this study, it was possible to investigate whether teacher overt behavior differed systematically because lessons were being videotaped for purposes of stimulated recall. No differences could be identified on the basis of the low inference data; however, on several variables the high inference data suggested somewhat different classroom behavior when lessons were not being videotaped.

These observations are recognized as providing, at best, circumstantial evidence regarding the impact of stimulated recall on overt teacher behavior. They do not directly address the issue of whether the teachers changed their behavior in reaction to what they observed concerning either their own or pupil behavior, or on the basis of their interactive or postactive thoughts. There exists a need for a study designed specifically to investigate such issues.

Teacher comments recorded in the protocols of this study suggest that two aspects which need to be addressed are;

1. the impact on the teacher of observing pupil behavior, responses and reactions from the different perspective afforded by the videotaped recording. This difference should be perceived not only from the different view point furnished by the camera, but more particularly the different context in which it is observed.

   When reviewing videotapes both teachers commented on observing classroom behavior which they had not noticed in the interactive situation. Most of these related to off-task behavior. In at least one case Teacher 6 reported speaking to a pupil following such an event. The degree to which the experience of observing such behavior impacted subsequent management and control strategies is not clear; however, both teachers recorded higher percentages of interactive thoughts related to management and control in individual lessons prior to the in-service experience but following the first stimulated recall interview. This higher level was not maintained after the in-service experience. A similar situation was reflected in the phenomenon Teacher Monitoring - Classroom management and control.

   In the stimulated recall situation, as a teacher views the taped lesson he is in a unique position, for while he is part of the situation being observed he is at the same time removed from it and the complex of variables and pressures contained within it. Does this somewhat removed, non-threatening, non-evaluative context yield a different perspective of the interactive events and serve to impact teacher behavior in subsequent lessons? The data of this study do not answer this question.

2. the impact on teacher behavior of observing his own teaching strategies. Both teachers passed evaluative comments regarding their teaching styles and classroom practices as they observed them on videotape. How this or the articulation of interactive thoughts which preceded observed action served to change subsequent classroom behavior is unknown.

   Interactive thoughts reflecting self awareness do not support an impact by the experience.

When asked to reflect on the impact stimulated recall had on their thinking both teachers claimed to have been made more conscious of their thoughts. This would seem to be attributable to the act of articulating one's thoughts and also of teaching a lesson aware that one would be required to recall interactive thoughts in a subsequent interview.

Despite this, the question remains as to whether the teachers thought differently as a result of this raised level of consciousness of their thoughts.

Analysis of the protocols revealed evidence of change in the interactive thinking of the teachers which could not be imputed to the in-service experience. For Teacher 3 these related to awareness of, and concern for teaching techniques and strategies; the monitoring of the impact of instructional strategies and perception of non-verbal behavior. The interactive thoughts of Teacher 6 contained evidence of change which was non-contiguous with the in-service experience. Such thoughts concerned classroom management and control; perceptions of elements of the learning environment and interpretations of perceptions. In the case of the latter two, the change was maintained.

How much of the above change in teacher thought processes is attributable to the technique of stimulated recall, lesson-specific events, the in-service experience, other events in the teachers' environment or combinations of these is not answered from the data in this study.

In concluding the discussion of the results, it is pertinent to comment on why two teachers rather than one were selected to participate in this study. The first reason was pragmatic, representing a protective measure in the event of one of the teachers being unable or unwilling to continue for the full period of the longitudinal study. The second reason lay in the nature of the study which was not designed to be comparative, but rather exploratory and descriptive. Having two grades represented broadened the scope of the description, but more significantly, in an exploratory context permitted comparisons in order to identify trends.

CHAPTER VII

CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

Outline of the Study

Until recently the main emphasis in research into teaching and teacher effectiveness has focused on teacher and learner behavior.

As a consequence of the growing awareness of the need to investigate all dimensions of teacher behavior research has increasingly addressed the issue of the cognitive processes of teachers in both the preactive and interactive phases of instruction. Such research is based on the assumption that cognitive processes are precursors and determinants of teaching acts.

This study was predicated on a model of the teacher as an information processor.

Purpose

Using introspective methodology this study investigated the impact of a planned intervention program on the interactive thoughts of teachers. Changes in interactive thought processes were compared with changes in overt classroom behavior in order to determine the extent to which changes in interactive thinking were translated into changes in classroom practices. Further, the study examined whether the intervention program impacted the preactive thinking of teachers and whether teacher thoughts or behavior changed as a result of stimulated recall.

Methodology

Introspective reports of the interactive thoughts of a Grade Three and a Grade Six teacher were obtained in language arts and mathematics lessons by means of stimulated recall. With each teacher four lessons were videotaped before the intervention program for the purpose of facilitating the recall of interactive thoughts; four lessons were videotaped immediately following the intervention program and a further two lessons were videotaped after one month. Stimulated recall interviews were conducted within twenty four hours of the videotaping of each lesson.

Pre-instructional interviews were conducted prior to the commencement of each lesson in order to obtain an overview of the features of the lesson together with details of the planning phases addressed by the teacher in preparation of the lesson.

For each videotaped lesson teacher process data were obtained using a specially developed multi-faceted observation schedule. As part of the larger study process data were collected for additional lessons in each subject area.

The planned intervention program took the form of an in-service program comprising teaching skills and/or behaviors identified from recent research as being effective in achieving certain process or product goals of classroom instruction.

Analysis Techniques

In this study the purpose of analysis was two fold: the first being to describe the characteristics of teacher thought processes and teacher overt behavior revealed in the study, and the second to trace change in these as a result of the intervention program.

In order to preserve the richness and complexity of the data the transcripts of the stimulated recall interviews were analyzed at two levels. At a micro level the interactive thoughts were coded using a content analysis system in which the thought or ideational units were placed in one of ten categories. Change in distribution of the thought units across the categories for lessons in the different phases of the study was taken to indicate change in the interactive thinking of the teacher. Following this the protocols were analyzed globally or at a macro level for the purpose of identifying phenomena which characterized the total thoughts of the teachers. Change in the frequency of occurrence of the phenomena was taken as an index of change in teacher thought processes.

Conclusions

The limitations involved in this study, namely the small number of subjects, the limited number of lessons over which teacher thoughts were obtained and the non-random selection of lessons preclude the drawing of generalizations beyond the teachers involved in the study.

Positive measures comparable to those described in similar research were taken to limit the obtrusive effects of the researcher and videotaping equipment on the natural classroom setting. Despite these precautionary measures it is not possible to assess the impact on the teachers' thought processes of involvement in the larger study, participation in this study or the presence of the coder in the room. Regardless of the substance of the intervention program, these experiences singly or collectively may have served to generate anxiety, or produce concern regarding teaching strategies, discipline and control.

Furthermore the intervention program constituted one known event within the teachers' environment during the duration of the study.

The following conclusions must be regarded in the light of the above qualifications.

1. Change in Teacher Thought Processes

i. Neither widespread nor systematic change attributable to the intervention program occurred in the interactive thoughts of the teachers.

ii. While subcategorization served to highlight more extensive change, the change does not appear to have occurred in cognate areas.

iii. Change occurring in the phenomena which characterized the total thoughts of the teachers, while somewhat more widespread, was no more systematic than in the interactive thoughts of the teachers.

iv. Change in the phenomena identified in the total thoughts of the teachers was frequently reflected in change in interactive thoughts.

2. Change in Overt Classroom Behavior

i. Over the period of the study the change in overt teacher behavior was both widespread and complex, although change was not observed in all facets of classroom behavior.

ii. Change does not appear to have impacted the teachers' teaching skills in a systematic manner.

iii. Change was frequently adopted into a subject area context rather than more generally into the teacher's repertoire of teaching skills.

iv. The direction of change of behavior was not always consonant with that advocated in the teaching strategy which comprised the intervention program.

v. Over the duration of the study the pattern of change observed in overt teacher behavior was complex. In some 50 percent of the cases where change was identified, the direction of change observed after the intervention program had reversed one month later.

vi. A commonly noted pattern of change was where a teacher, coded as employing a teaching skill less frequently immediately after the intervention program, returned to the initial level of usage after one month.

vii. The intervention program was not perceived by the teachers as having resulted in widespread change in their classroom behaviors.

viii. Analysis of the high inference data of the larger study indicated that on twenty five of the thirty one behaviors, significant change occurred after the in-service treatment.

3. Relationship of Change in Thoughts and Change in Overt Behavior

In this study any attempt to establish the relationship between change in interactive thoughts and change in overt behavior is predicated on the assumption that the overt behaviors which were identified and measured reflected the categories of teacher thought identified in the stimulated recall protocols.

Throughout the study there was a lack of congruence between change in interactive thinking and change in classroom behavior, suggesting the existence of a complex relationship between the two variables.

i. Change in behavior was observed which was parallel to change in interactive thinking.

ii. Change in behavior occurred which was not reflected in changed interactive thinking.

iii. Instances were recorded where the interactive thinking of the two teachers changed differently, however their behavior changed in the same manner.

iv. Similar changes in interactive thinking was translated into different overt behavior.

4. Change in Preactive Thoughts

i. A wide range of planning components was reported as having been considered by one teacher during the period of the study; however, for that teacher usually only three components were addressed in the preparation of any given lesson.

ii. Minimal change in the preactive thoughts of the teachers was observed over the course of the study.

iii. Due to its timing, a consistently adopted change in planning could not be directly attributed to the intervention program.

iv. The planning practices reported by the teachers conformed to the research findings contained in the literature.

5. Impact of Stimulated Recall

i. There was no evidence in the data that engaging in stimulated recall resulted in change in the teachers' interactive thinking or overt behavior.

ii. There is evidence to suggest that with regard to some classroom behaviors, the teachers acted differently when lessons were being videotaped.

iii. The impact of self confrontation was evidenced with one of the teachers.

iv. Both teachers reported that their experience with stimulated recall had served to make them more aware of their interactive thoughts. They did not perceive it as having impacted their classroom behavior.

Implications and Recommendations

Research into the covert mental activity of teachers during instruction is a relatively new area of investigation. This exploratory study, which is perhaps the first to address the topic of teacher thought processes from a longitudinal perspective for the purpose of identifying change, has revealed several prospective research directions.

Teacher Thought Processes

1. Unlike the studies into teacher thought processes conducted by Marland (1977), Conners (1978) and Cooper (1979) this study has raised the issue of the relationships which exists between the teachers' interactive thoughts and the total thoughts reported in the stimulated recall interviews.

In this study it was postulated that the phenomena identified by means of macro-analysis of the total thoughts provided valuable insight into the underlying educational philosophy of the teacher and represented the broader context within which interactive thoughts were located.

To clarify this relationship, further investigation is needed. Such research might take the form of an ethnographic study of one teacher as a means of collecting sufficient data to support detailed description of the teacher's educational philosophy. This would then serve as a basis for the amplification of the relationship between the interactive thoughts and the phenomena identified in the total thoughts of the teacher reported in stimulated recall interviews.

2. Further longitudinal studies need to be conducted to investigate and describe more fully the nature of change in teacher thought processes and overt classroom behavior in the period following an intervention program. Such studies should include:
   i. design features to control for coder expectation;
   ii. sufficient, spaced observations to facilitate the identification of trends of change rather than short-term fluctuations.
   iii. indepth interviews with teachers to collect information concerning their perception and interpretation of the change which occurred. This may serve to provide a context within which to interpret the observed change.

3. This study has served to highlight the complex relationship between changes in thought processes and changes in overt behavior. Further research is required to amplify this relationship.

Methodological Studies

Stimulated recall. Stimulated recall has not been widely used in naturalistic settings and to the researcher's knowledge this is the first longitudinal study in which the technique has been employed to investigate teacher thoughts during instruction. Experience with the technique in this study leads the researcher to identify the following aspects of the methodology as requiring further investigation.

1. To what degree is it necessary to observe subsequent familiarization procedures where stimulated recall is used in a longitudinal study and the interviews are separated by significant periods of time? If subsequent familiarization periods are necessary, in what manner should they differ from the initial procedures? Measurement of what constitutes a "significant" period of time would also be necessary.
2. In a longitudinal study, given that care is taken initially to establish rapport, do teachers reveal either quantitatively or qualitatively different thoughts in stimulated recall interviews as the relationship/rapport develops between researcher and subject? Is the manifestation of this greater with interactive or non-interactive thoughts?

3. Research is needed to determine the degree to which teachers approach stimulated recall sessions as part of an ongoing event. To what extent are non-interactive thoughts revealed serially, dependent upon the relationship developed over time between researcher and teacher? Do teachers refrain from reiterating non-interactive thoughts similar to those reported earlier in the interview or in a previous interview? If this is so, what implication does it hold for the identification of change in non-interactive thoughts of teachers? With what confidence can a decrease in the frequency with which non-interactive thoughts are reported be interpreted as representing real change?

   If there exists a reticence to repeat previously reported thoughts what is the implication for the selection of stimulus points in the stimulated recall interview? In a longitudinal study will teachers refrain from selecting similar stimulus points? It was anticipated that this study would trace teacher selection of stimulus points; however, as described in Appendix E, the teachers' tendency to maintain eye contact when reporting thoughts precluded the recording of the necessary data.

4. Research is needed to determine the optimal pattern for conducting stimulated recall in a longitudinal study. It will be necessary to obtain information on the threshold of teachers regarding the span of time over which they would be prepared to participate; the frequency with which they would accept the researcher into the classroom; and the

amount of time they would be prepared to devote to the stimulated recall interviews knowing the long term nature of their commitment.

5. To minimize researcher obtrusiveness and to avoid filming into a major light source, the videotaping of lessons in this study, as with Marland (1977), Conners (1978) and Cooper (1979), was filmed from a back corner of the teaching space. This resulted in some disparity between the initial visual image the teacher perceived in the interactive situation and the visual image presented as a stimulus for the recall of interactive thoughts. On occasions this resulted in the teacher being distracted by viewing situations on the videotape which he had not perceived in the interactive situation, the consequence of which often was defensiveness and rationalization which may have detracted from the reporting of interactive thoughts.

   There is need for the development of filming techniques to enable the researcher to capture visual images which closely approximate the perception of the teacher at the time of instruction. This suggests the need for the use of more sophisticated filming techniques employing several remotely controlled cameras located around the teaching space. The use of such technology implies a laboratory rather than naturalistic setting and the benefits perceived to accrue to such filming in the form of enhanced recall would need to be weighed against the impact such a setting might have on teacher-pupil interaction and behaviors.

6. There exists a need for a follow-up study to investigate whether in this study stimulated recall interacted, or interfered with the intervention program to result in the pattern of change observed in the overt behavior of the two teachers.
7. Longitudinal studies using stimulated recall need to be continued specifically to determine the impact of stimulated recall on teacher thoughts and teacher overt behavior.
8. In order to increase confidence with regard to the validity of introspective data a variety of techniques should be employed to permit triangulation of data, comparable to that achieved by Shulman and Elstein (1975) in their research into the decision making of physicians.

Content analysis. Guetzkow (1950) advocated the use of subcategories as a means of overcoming the danger of loss of richness of data by "lumping" many units into a single broad category. In this study where content analysis was used as a means of identifying change in teacher thoughts it was apparent that change could be masked by the use of categories which were too broad. Researchers planning to use content analysis as a means of tracing change in thought processes should take cognizance of this feature in establishing categories and subcategories.

The results of this study hold implications for teacher education and educational administration.

Teacher Education

In this discussion teacher education is cast broadly to embrace the educative process commenced in pre-service programs and continued in the in-service setting. From this perspective the pre-service experience represents the foundation for subsequent professional development.

1. The literature which has been generated in the area of teacher thought processes should be incorporated into teacher education curricula. Exposure of teachers to the theory and research on information processing, decision making, problem solving and planning would serve to sensitize them to these issues, make them aware of their own functioning and of common limitations.
2. Stimulated recall appears to represent a technique for effecting change in teacher thoughts or classroom practices by requiring the teacher to verbalize the interactive thoughts which preceded a particular action. The raising of the level of consciousness concerning interactive thoughts may serve to impinge on the teacher's interactive thinking or his overt behavior.

   For the reasons of the time and cost involved this technique is conceived as being valuable in a remedial setting.
3. Self confrontation could be used as a technique for sensitizing teachers to the need for change. This could be

incorporated as a feature of an intervention program.

4. Supervision for the purpose of improving teacher effectiveness could be enhanced by the use of introspective methodology, for by this means the thoughts underlying particular behavior could be revealed. This would facilitate clarification of any differences between act and action meaning and permit the supervisor to consider teacher intent.

   Knowledge of the thought processes of a teacher may explain why change was or was not accepted into the teaching skills of the teacher.

5. The application of introspective techniques in teacher education appears to hold potential as a means of making both student teachers and classroom practitioners aware of their cognitive functioning at the preactive and interactive phases of teaching. By being sensitized to the information to which they do attend and the background information on which they draw, teachers' functioning as information processors may be enhanced.

6. The findings of this study regarding the preactive thoughts of teachers corroborate the findings of other studies which have addressed the issue of lesson planning. Teacher educators need to devise techniques whereby they can impact teacher thoughts regarding lesson planning. Traditional methods appear to fall short in this regard.

Educational Administration

1. From the literature which has been generated in the area of teacher thought processes it is apparent that extensive research needs to be conducted in order to describe and understand these cognitive processes, and to assess their impact on teachers as organizational members, on schools as organizations and on administrative behavior.
2. Research findings related to teacher thought processes hold implication for the preparation and professional development of the educational administrator. Such programs should acquaint the administrator with the emerging literature related to the covert cognitive processes of teachers and should focus specifically on the issues of information processing, decision making, problem solving, planning and rationality.
3. If innovation and change must be mediated through the minds of teachers (Shulman, 1974), and if "recommendations . . . must be consistent with the information-processing capacities, beliefs and motives of teachers" (NIE, 1975:2), then how teachers think represents a potential limit to change. This implies that either change and innovation may have to be adapted to the thought processes of the teachers, or that teachers' cognitive processes will have to be modified through in-service education programs. With regard to the latter, the results of this study suggest that the traditional in-service experience may not necessarily impact underlying beliefs and attitudes.

4. Further research is necessary to amplify the relationship between change in teacher thought processes and change in overt behavior. It behooves educational administrators to investigate this relationship if innovation is to be systematically introduced and adopted.

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APPENDIX A

TEACHING STRATEGIES

TEACHING STRATEGIES

Behavior Management and Classroom Discipline

1. Teachers should have a system of rules that allows pupils to attend to their personal and procedural needs without having to check with the teacher.
2. Teachers should be aware of what is happening throughout a classroom even though involved with an individual or small group. This will enable the teacher to spot potentially disruptive behavior and act upon it before it becomes unmanageable.
3. Teachers should handle disruptive situations in a low-key manner. Disruptive or off-task students should be corrected by non-verbal behavior such as eye contact.
4. Teachers should prevent misbehaviors from continuing before they increase in severity or spread to and affect other children.
5. Teachers should attempt to direct disciplinary action accurately -- that is, at the child who is the primary cause of the disruption.
6. Teachers (and aides, if present) should move around the room, monitor pupils' seatwork, and communicate to the pupils an awareness of their behavior, while also attending to their academic needs.

Instructional Methods

7. Teachers should keep to a minimum such activities as giving directions and organizing the class for instruction. They can do this by writing the daily schedule on the board ensuring that pupils know where to go and what to do, etc. Listening skills should also be emphasized.

8. When students work independently, teachers should ensure that the assignments are interesting and worthwhile and still easy enough to be completed by each pupil working without teacher direction.
9. Teachers should organize and manage their classes so as to optimize academic learning time -- time during which pupils are actively and productively engaged in their learning tasks.
10.
    i. Teachers should use a standard signal to get the students' attention when beginning a class or moving from one grouping arrangement to another.
    ii. Teachers should not begin speaking to the group until all students are paying attention.
    iii. Teachers should stop speaking or instruct a contributing student to stop speaking until all students are paying attention.
11. Teachers should provide a clear presentation of material. There are a number of ways to do this:
    i. Teachers should check student understanding of a task by asking them to explain what is expected of them.
    ii. Teachers should present information to students in a clear orderly, well-organized manner.
    iii. Teachers should communicate at a pupil's level of comprehension.
    iv. Teachers should have a sufficient knowledge of the subject matter.
12. Teachers should spend at least one-third to one-half of their time instructing larger groups of pupils (more than eight children). When they do teach smaller groups or individuals, they should take

steps to make sure that the other pupils in the class have work to which they can attend.

13. Teachers should use a variety of instructional techniques -- adapting instruction in an effort to meet the learning needs of the individual students. Examples of some instructional techniques: varying group size, lecture, discussion, use of audio-visual aids etc.

14. Teachers should pre-plan their classroom activities on a regular basis.

15. In Language Arts classes, teachers should increase the amount of written work so that each pupil does some writing every day.

16.
    i. Teachers should encourage quantity and quality of work in Language Arts. To overcome the problem of marking, the teacher could mark the work selectively -- choosing some but not all of the assignments and concentrating on one skill at a time. A daily diary could be kept by students to increase fluency in writing.

    ii. Teachers should "spot-correct" students' Math assignments daily. Some methods of doing this are selecting a representative sample of questions to mark, selecting the work of a few students to mark, or having students mark their own work. At least once a week teachers should mark an assignment of each student.

17. Teachers should relate Math games and independent activities to the concepts being taught or use them to reinforce past learning. They should not be used as a reward for completing written work. All students should be given the opportunity to participate.

18. In Mathematics classes, teachers should use techniques which provide for gradual transition from concrete to more abstract activities.

Specific Methods for Asking Questions and Providing Feedback

19. Teachers should avoid calling on volunteers more than 10 or 15 percent of the time during question-and-answer sessions. It is also advisable to discourage pupil "call outs".
20. Teachers should aim at getting the child to give some kind of response to a question. Rephrasing, giving clues, or asking a new question can be useful techniques for bringing forth some answers from a previously silent pupil or one who says, "I don't know" or answers incorrectly.
21. Teachers should use an appropriate mixture of low and high order questions. Low order questions should primarily be asked when basic factual material is being dealt with, in order to ensure that a basis for high order conceptualization has been laid. Higher order questions can then be used to enlarge upon basic concepts.
22. Teachers should use praise to reward outstanding work as well as to encourage students who are not always able to do outstanding work.
23. Teachers should use mild criticism, on occasion, in order to communicate expectations to more able pupils.
24. Withitness -- the extent to which the teacher is aware of what is going on in the classroom.
25. Overlappingness -- the extent to which the teacher is able to attend to more than one issue at a time.
26. Smoothness -- the extent to which the teacher facilitates the smooth

flow of the lesson or a smooth transition from one activity to another.

27. Momentum -- the extent to which the teacher's behavior maintains the pace of the lesson.
28. Clarity -- the extent to which the teacher's meaning is clear in presentations to the class.
29. Persuasiveness -- the extent to which the teacher is able to motivate children.
30. Warmth -- the extent to which the teacher provides evidence of "caring", "accepting" and "valuing" of the children.
31. Empathy -- the extent to which the teacher responds accurately to both obvious and less obvious meanings, feelings, and experiences of the children.

APPENDIX B

EXAMPLES OF DESCRIPTIONS OF TEACHING STRATEGIES

(drawn from in-service material)

EXAMPLES OF DESCRIPTIONS OF TEACHING STRATEGIES

1. Teachers should have a system of rules that allows pupils to attend to their personal and procedural needs without having to check with the teacher.

A list of classroom rules should be formulated in cooperation with the students. A rationale, and class discussion of these rules should promote acceptance. These rules should be posted in the classroom for easy reference.

If teachers are preparing students for effective and intelligent participation in their classrooms then, they must provide pupils with a set of democratic ideals. The students should practice these ideals in appropriate and constructive ways.

Pupils will follow a set of rules and procedures which have been set down. The teacher creates an atmosphere that encourages the sharing of ideas and respect for each individual. The pupils share decision-making with the teacher concerning the implementation of rules that will work for the particular classroom. If students work in a democratic classroom they take part in cooperative planning, in task involvement, and assume responsibility for their own behavior. Rules and behaviors set up cooperatively lead to the development of a sense of social responsibility, a positive attitude towards school and learning, and an ability to make appropriate and productive social decisions.

Appropriate Situation - T: Class, it's time to start language now, so if you'd get out your dictionaries and turn to the correct page, we'll begin (the page numbers are written on the board). (Robbie, next to James, does not have his book out). T: Good, I'm glad to see that James knows exactly what page to turn to. He's learning to look at the board and read the correct page number.

Inappropriate Situation - A language arts teacher has her class organized into two basic reading groups. While working with one group, the other group of students is working independently on activities introduced by the teacher. The sequence of these activities is written on the board. While at a really critical motivational point with the second group, Warren shouts across the room to Ms. Brown: "Teacher, teacher, I have to leave the room!"

2. Teachers should be aware of what is happening throughout a classroom even though involved with an individual or small group. This will enable the teacher to spot potentially disruptive behavior and act upon it before it becomes unmanageable.

A teacher should demonstrate an awareness of what is going on in the total classroom. This teacher behavior tends to increase student work involvement and decrease deviant or disruptive student behavior.

If the teacher is in one part of the room she should be aware of off-task or deviant behavior occurring elsewhere in the room.

Non-verbal gestures or signals are appropriate to re-direct off-task students. Group attention should not be drawn to misbehaving students.

Appropriate Situation - The teacher is working with a group of five students. The rest of the class is working on a common math assignment. The teacher catches the misbehavior before the rest of the class becomes affected and redirects the off-task student through eye contact. She continues working with the small group.

Inappropriate Situation - The teacher is helping a student with a problem at the blackboard. Her back is turned to the class. One student is whistling in another part of the room. There is giggling and laughing. The teacher continues as though nothing has occurred.

3. Teachers should handle disruptive situations in a low-key manner. Disruptive or off-task students should be corrected by non-verbal behavior such as eye contact.

A teacher should not over-react to disruptive situations. Generally a quiet tone can be used with misbehaving students. The whole class does not have to hear the corrective communication between teacher and student.

A teacher should establish eye contact, if possible, and move toward those particular students involved in the disturbance. The teacher should not discontinue her lesson to discipline an individual student.

Appropriate Situation #1 - Music teacher says: Let's play "F". From "F" go to "G", then "A". Now very softly "G". (students play notes in order as the teacher calls them. James is not playing his recorder, but is poking a pencil in the back of a student in front of him).
T: James, would you please clap the rhythms from the board today? Try two measures.
James: (claps out the rhythm)
T: Excellent. James has clapped it; now let's see if Julie can play it for us on the recorder. Begin Julie.

Appropriate Situation #2 - Students are working on a specific math assignment. The teacher walks around the room and approaches students who are off-task and with a few words, gestures etc., keeps the students on task. The disciplining is done in a quiet manner.

Inappropriate Situation - During a grade three language arts lesson, Robert is playimg with several toy cars on his desk. The teacher asks Robert a question to which there is no response - The teacher replies: (while grabbing the cars) "Robert, you must stop fooling around with those baby things and pay attention to what we are doing. You will never get to grade four that way. So pay attention . . . ."

APPENDIX C

PRE-INSTRUCTIONAL INTERVIEW

PRE-INSTRUCTIONAL INTERVIEW

Prior to the videotaping of each stimulus lesson a pre-instructional interview was conducted for the purpose of gaining an overview of the major phases of the lesson to provide a context within which to identify stimulus points, and to interpret the teacher's interactive thought processes.

While every opportunity was provided for the teacher to reveal the lesson plan, the interview was intentionally kept short to avoid forcing the teacher to justify his planning or modify the plans developed (Conners, 1978:323).

Interview Strategy

1. The interview was audiotaped for later transcribing.
2. The open-ended question "What will be happening in this lesson?" was posed by the researcher to facilitate the teacher's disclosure of his planning concerning lesson objectives, content, materials, strategies and evaluation.
3. Follow-up questions were used to elicit details of any of the above issues not mentioned by the teacher.
4. In order to gain understanding of the planning phases the teacher followed in developing the lesson, the following questions were asked:

   "What planning steps did you observe in developing this lesson?"

   "With which of the above steps did you commence planning?"

   With respect to these questions the teacher's statements were accepted and no follow-up questions were asked in order to avoid the inference that planning phases had been missed, or that a different sequencing was more appropriate.

5. During the pre-instructional interview the researcher;
    - i. adopted a facilitative role to enable the teacher to disclose fully the lesson planning,
    - ii. adopted a non-committal attitude, avoiding evaluative comments,
    - iii. avoided leading questions and offering suggestion,
    - iv. couched follow-up questions in the teacher's own words,
    - v. refrained from requiring the teacher to describe the lesson in precise detail to avoid locking him into a lesson structure which would deny later instructional flexibility.

APPENDIX D

OBSERVATION SCHEDULE

QUEST

A joint project of the Centre for Research in Teaching and the Edmonton Public School Board. Winter 1978-1979.

Teacher ______________

Booklet Identification Number ______________

School ______________

Month, Day, Year. ______________

Grade ______________

Time ______________

Number of children enrolled ______________

Main Subject Content of Observed Lesson

____

____

____

____

____

____

____

____

Number of children present during observed lesson ______________

Total Class Duration

______ hour(s) ______ minutes

Start time ______________

Finish time ______________

Coder ______________

2

I.D. Nº. ____________

SKETCH OF THE CLASSROOM

I.D. N°. ______

3

CLASSROOM ACTIVITY DESCRIPTION

TIME	WHO	WHERE	WHAT

4

I.D. No. ____________

THREE MINUTE OBSERVATION SCHEDULE

start time ____________
finish time ____________

FEEDBACK ACADEMIC MANAGERIAL			Warn																		
			- -																		
			+ +																		
CHILD-INITIATED INTERACTION	TEACHER RESPONSE TO CHILD-INITIATED INTERACTION		Brief																		
			Long																		
			Redirect																		
			Shift																		
			Integrate																		
			Not Accept																		
			Accept																		
			Delay																		
			O																		
			- -																		
			+ +																		
	TYPE OF INTER-ACTION		Irrelevant																		
			Relevant																		
			Call Out																		
			Comment																		
			Question																		
TEACHER-INITIATED INTERACTION	TEACHER RESPONSE TO CHILD's ANSWER	SUS-TAIN-ING	Rep. Ch. Ans.																		
			New Q.																		
			Rep. Q. Clue																		
		TERMINAL	Ask Other																		
			Give Ans.																		
			Process																		
			Negate																		
			Affirm																		
			Ignore																		
			Criticise - -																		
			Praise + +																		
	QUALITY OF CHILD's ANSWER		Call Out																		
			No Response																		
			Don't Know																		
			Wrong -																		
			Partly + -																		
			Correct +																		
	PUPIL SELECT-ION		Call Out																		
			Volunteer																		
			Non Vol																		
			Pre Select																		
	QUEST-ION TYPE		Self Ref																		
			Choice																		
			Process																		
			Product																		
GROUP-ING MODE			Whole Class																		
			Large Gr.																		
			Small Gr.																		
			One Child																		
			Who																		

I.D. N°.

5a

HIGH INFERENCE CODING SHEET

1. Teacher used a system of rules dealing with personal and procedural matters.

1 2 3 4 5
LOW MED HIGH ____________ Not Observed

2. Teacher prevented misbehaviors from continuing.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

3. Teacher directed disciplinary action accurately.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

4. Teacher moved around the room a lot (monitoring seatwork).

1 2 3 4 5
LOW MED HIGH ____________ N. O.

5. Teacher handled disruptive situations in a low-key manner (non-verbal, proximity, eye contact)

1 2 3 4 5
LOW MED HIGH ____________ N. O.

6. Teacher insured assignments were interesting and worthwhile while children worked independently.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

7. Teacher used a system of rules which allowed pupils to carry out learning tasks with a minimum of direction.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

8. Teacher optimized academic learning time. Pupils were actively involved and productively engaged in learning tasks.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

9. Teacher used a standard signal to get students' attention.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

I.D. N°. ____________ 5b

10. Teacher did not begin speaking to the group until all students were paying attention.

1 2 3 4 5

LOW MED HIGH ____________ N. O.

11. Teacher stopped speaking/instructing until all students were paying attention.

1 2 3 4 5

LOW MED HIGH ____________ N. O.

12. Teacher used a variety of instructional techniques adapting instruction to meet learning needs.

1 2 3 4 5

LOW MED HIGH ____________ N. O.

13. Teacher encouraged quantity and quality of work in Language Arts.

1 2 3 4 5

LOW MED HIGH ____________ N. O.

14. Teacher used a system of spot-checking assignments.

1 2 3 4 5

LOW MED HIGH ____________ N. O.

* (Do not complete until last minute.)

15. Teacher related math games and independent activities to the concepts being taught.

1 2 3 4 5

LOW MED HIGH ____________ N. O.

* (Do not complete until last visit)

16. Teacher increased the amount of written work so that pupils did some writing every day.

1 2 3 4 5

LOW MED HIGH ____________ N. O.

17. Teacher used techniques that provide for the gradual transition from concrete to more abstract activities.

1 2 3 4 5

LOW MED HIGH ____________ N. O.

5c

I.D. N°. ____________

18. Teacher used an appropriate mixture of high and low order questions.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

19. Teacher was aware of what was going on in the classroom.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

20. Teacher was able to attend to more than one issue at a time.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

21. Teacher facilitated the smooth flow of the lesson or a smooth transition from one activity to another.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

22. Teacher's behavior maintained the pace of the lesson.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

23. Teacher was clear in presentations to the class.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

24. Teacher was able to motivate children.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

25. Teacher provided evidence of "caring", "accepting", and "valuing" of the children.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

26. Teacher responded accurately to both obvious and less obvious meanings, feelings, and experiences of the children.

1 2 3 4 5
LOW MED HIGH ____________ N. O.

I.D. No. ______________

NEW HIGH INFERENCE VARIABLES

Note: For the following items, please use the five-point scale to indicate how frequently the behaviors occurred during the period observed.

27. Many different pupils were selected by the teacher, to respond to questions.

1 2 3 4 5
LOW MED HIGH
______________ N. O.

28. When pupils' answers were incorrect or only partially correct, the teacher used techniques such as rephrasing, giving clues, or asking a new question to help the pupil to give improved response.

1 2 3 4 5
LOW MED HIGH
______________ N. O.

29. The teacher used praise to reward outstanding work as well as to encourage pupils who were not always able to do outstanding work.

1 2 3 4 5
LOW MED HIGH
______________ N. O.

30. The teacher used mild criticism on occasion to communicate expectations to more able pupils.

1 2 3 4 5
LOW MED HIGH
______________ N. O.

31. When pupils initiated interaction, the teacher accepted and integrated the pupil question, comment or other contribution.

1 2 3 4 5
LOW MED HIGH
______________ N. O.

7

I.D. No. ____________

INSTRUCTIONAL MATERIALS INVENTORY

(to be completed during the 7 minute phase)

Check ☑ if item was used during observed lesson.

GAMES, TOYS, PLAY EQUIPMENT

- ☐ puzzles, games
- ☐ story books
- ☐ animals, other nature objects
- ☐ other ____________

INSTRUCTIONAL MATERIALS

- ☐ text
- ☐ worksheet
- ☐ charts
- ☐ pictures
- ☐ film
- ☐ filmstrip
- ☐ other ____________

A. V. EQUIPMENT

- ☐ T. V.
- ☐ record player
- ☐ cassette tape player
- ☐ overhead projector
- ☐ other ____________

GENERAL EQUIPMENT

- ☐ children's own products display
- ☐ other displays for children
- ☐ magazines
- ☐ achievement chart
- ☐ sink
- ☐ arts and crafts materials
- ☐ blackboard
- ☐ feltboard
- ☐ easel
- ☐ other (please specify) ____________

APPENDIX E

STIMULATED RECALL INTERVIEW PROCEDURES

STIMULATED RECALL INTERVIEW PROCEDURES

Interview Procedures

The following procedures were adopted in conducting the stimulated recall sessions in this study:

1. The stimulated recall sessions were held in a quiet location free from interruption. This was deemed important if the teacher was to relax and feel free to recall and report ". . . the most private of his thoughts . . . ." (Bloom, 1953:162).
2. The equipment was arranged as indicated in Figure 2, with the teacher located in front of the monitor for ease of viewing.

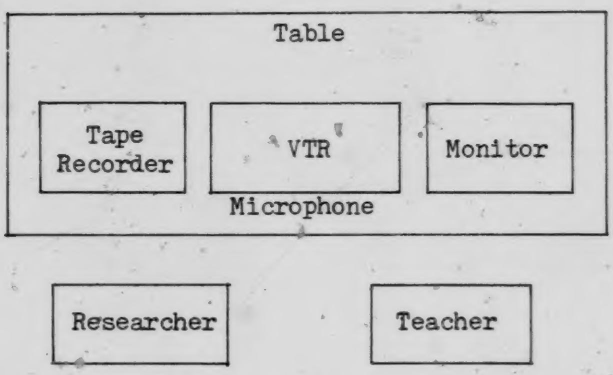

Figure 2: Arrangement of Equipment for Stimulated Recall Sessions.

The controls of the videotape recorder (VTR) were convenient to both researcher and teacher so that either could stop the replay. To enable the researcher to monitor the tape recording of the interviews the tape recorder was placed unobtrusively beside the VTR with the extension microphone located in front of both the researcher and teacher.

3. At the commencement of each interview:

   i. the researcher engaged the teacher in general conversation in order to establish a relaxed atmosphere;

   ii. the objectives of the study were reiterated to reduce the danger of the teacher constructing his own theory about the researcher's intentions and so distorting data;

   iii. the rationale for using visual and auditory stimuli to facilitate the reliving of the lesson was outlined;

   iv. the need for complete and accurate recall was stressed and the teacher was asked to,

      a. indicate when he could not recall the thoughts that occurred at a particular stimulus point,

      b. differentiate between thoughts which occurred during the lesson and those which occurred subsequently;

   v. the teacher was asked to concentrate on the videotaped replay in order to "relive" the lesson, and recall thoughts, feelings and reactions that were experienced during the lesson. The teacher was also asked to identify points at which decisions were made, reporting the alternatives considered and the reasons for selecting the particular alternative;

   vi. the teacher was reminded that the interview would focus on a sample of classroom events that occurred during the lesson. While the teacher was encouraged to identify stimulus points at which to stop the replay in order to recall his interactive thoughts, it was explained that the interviewer would also identify stimulus points;

vii. anonymity was assured and the confidentiality of the session was stressed;

viii. it was explained that the role of the researcher was to assist the teacher to recall and articulate thoughts and feelings as accurately and completely as possible. It was stressed that the researcher was not being evaluative of either the lesson or of the reported thoughts.

4. The researcher consciously sought to build on the rapport established in the familiarization period by attending to the affective dimensions such as respect, understanding and interest. To facilitate self discovery the researcher attempted to adopt an unobtrustive role, posing open-ended questions when teacher statements required elaboration or clarification. Leading questions or evaluative statements were avoided.

5. In order to describe the stimulus points at which the videotape was stopped by either the teacher or the researcher, it was planned that the researcher would record the counter number at each stop. This was abandoned in the study when it became apparent that the teachers wished to engage in a conversational exchange with the researcher rather than simply project their thoughts into a tape recorder. To assure the teacher of the importance of all that he reported, it was elected to engage in eye contact rather than record details of counter numbers.

Technical Procedures

1. The audiotapes of the stimulated recall sessions were transcribed, with the verbal exchange following each stimulus point segmented from others.
2. The transcribing of each audiotape was verified by the researcher who was able to use background knowledge of the lesson to interpret any sections with which the first transcriber experienced difficulty.

APPENDIX F

TECHNICAL PROCEDURES AND STRATEGIES FOR

1. PRE-INSTRUCTIONAL INTERVIEWS
2. VIDEOTAPING LESSONS
3. STIMULATED RECALL
4. TRANSCRIBING INTERVIEWS

TECHNICAL PROCEDURES AND STRATEGIES FOR

1. PRE-INSTRUCTIONAL INTERVIEWS
2. VIDEOTAPING LESSONS
3. STIMULATED RECALL
4. TRANSCRIBING INTERVIEWS

The procedures and strategies relating to the use of audio-visual equipment in this study are detailed below.

Preparation

1. All equipment was assembled and tested prior to delivery to the school to ensure:
   - i. researcher competence with the particular equipment in the event that it differed from that on which experience was gained in the laboratory;
   - ii. the equipment was complete;
   - iii. that all equipment was compatible and functional.

Pre-Instructional Interview

1. Because of its portability a cassette recorder was preferred to a reel-to-reel recorder.
2. Prior to the interview, a lesson identification was recorded at the begining of the tape specifying:
   - i. date;
   - ii. subject area;
   - iii. lesson code, comprising teacher, grade, and lesson number.
3. To ensure that the pre-instructional interview was not separated from the stimulated recall interview, both were recorded on the same tape.

Videotaping of Lessons

1. The focus of the filming for stimulated recall was the teacher and for this reason the recording equipment was located in a rear corner of the classroom. This enabled the researcher to be less obtrusive and to avoid filming directly into a major light source.
2. To minimize distractions to both teacher and pupils, the equipment was set up before the commencement of school. This provided opportunity for the researcher to ensure that all equipment was functional, and where problems were encountered, time existed to rectify them.
3. Throughout the lesson the quality of the film and sound recordings were monitored.
    - i. The quality of the film was checked by reference to the image on the monitor. Care was taken to minimize distraction by ensuring that the image on the monitor was not visable to the pupils.
    - ii. The sound recording was checked through the use of headphones.
4. A cordless or wireless microphone worn by the teacher was used to record sound within the classroom. This was found well suited to stimulated recall because all teacher speech was recorded irrespective of teacher movement or nature of verbal interaction.
5. During filming the camera was focused on the teacher and where possible the teacher's foci of interest. On the advice of King (1979) and on the basis of experience gained in the Pilot Study the use of the "zooming" technique for filming was avoided. The researcher refrained from filming classroom events which were not

the focus of the teacher's attention to avoid unnecessary distraction in the stimulated recall interview.

6. As the lesson was videotaped potential stimulus points were identified and recorded with the corresponding VTR counter number. This procedure was essential when the time between filming and the stimulated recall session precluded a review of the videotape. In order that the VTR counter number relevant to the stimulus point and the videotape remain synchronized, the tape was left threaded in the VTR between filming and stimulated recall sessions.

Stimulated Recall

1. A small (11") television monitor was used for stimulated recall. This represented a convenient size for the monitoring of film quality during filming although it was small for class viewing during the familiarization phase. Any disadvantage this represented was compensated in the stimulated recall sessions due to;
    i. the ease and comfort of viewing,
    ii. ready access by both researcher and teacher to the monitor's controls,
    iii. the sense of intimacy and privacy it afforded. This was judged significant in maintaining rapport.
2. The cassette recorder was placed where the researcher could readily monitor;
    i. that it was operating,
    ii. the volume level,
    iii. when the end of the tape was approaching.

   In order to record all verbal interactions the remote microphone was placed between the researcher and teacher.

Transcribing of Audiotapes

1. A Sony Secutive Transcriber was used for the transcribing and checking of all audiotapes. This offered the advantage over a regular recorder of;
    - i. foot controls,
    - ii. speed variation,
    - iii. automatic backspacing to ensure continuity.

Equipment Used

1. Television camera.
2. Videotape recorder - half inch tape.
3. 11" television monitor.
4. Equipment cart.
5. Cordless/wireless microphone.
6. Headphones.
7. Cassette recorder.

APPENDIX G

CONTENT ANALYSIS SYSTEM

CONTENT ANALYSIS SYSTEM

Introduction

This content analysis system was developed in order to categorize teachers' interactive thoughts. The structure and format of this system reflect those developed by Marland (1977), Conners (1978) and King (1979). The categories used in this system were generated after:

1. examination of the stimulated recall data;
2. consideration of the major research questions addressed in the study;
3. consideration of the characteristics of the teaching strategies which formed the substance of the in-service program.

Data

The data to be coded comprised transcripts prepared from audiotapes of interviews conducted with teachers as they viewed a videotaped recording of their lesson. Reporting of interactive thoughts and feelings was facilitated through the technique of stimulated recall.

Included in the stimulated recall protocols were both interactive and non-interactive data. Data of a non-interactive nature included:

1. thoughts and feelings related to pre-lesson and/or post-lesson experiences;
2. comments concerning the videotaping of the lesson or the nature of the interview situation;
3. a description or rationalization of observed classroom behavior;

4. comments on, and clarification of, interactive data.

Coding of Data

There are two major steps in this content analysis system:

1. Identification of interactive data;
2. Coding, which involves;
    i. unitization which is the identification of units of interactive data, and
    ii. placement of these units of interactive data into categories.

Identification of Interactive Data

While at the outset of each stimulated recall interview the objectives of the study were reiterated, the rationale of stimulated recall was outlined, and the teacher was asked to distinguish between interactive and non-interactive thoughts, differentiation between interactive and non-interactive data remains largely the task of the coder.

The interview protocols contain clues which simplify the task of distinguishing interactive from non-interactive data. Examples of clues which indicate interactive data are:

> T: Well I thought perhaps I hadn't chosen the right name to describe it's color.
>
> T: I thought that if they sat closer they would hear better.
>
> T: Instead of saying anything to Andrew I thought I'd just move over and touch him. I didn't want to disrupt Kristen's reading . . . .

Similarly, clues in the transcripts indicate non-interactive data (interactive data are underlined):

T: I notice that I ask a question, and don't ask it properly, and rephrase it.

T: Oh yes it's one that I value, but that isn't the reaction I was thinking of there. I didn't want to crush it. So that was my response.

T: Well now I didn't see - I think I forgot about it when I did the second example but I see that I - I did it in the first but I forgot to do it in the second example.
I: Were you conscious of that in the lesson?
T: No, but I am now.

Guidelines

For the situations in which the obvious clues are not available to assist the coder in distinguishing between interactive and non-interactive data, the following guidelines have been formulated on the basis of those developed by Marland (1977), Conners (1978) and King (1979). The guidelines specified below contain examples drawn from this study. In examples of non-interactive data, any interactive data included have been underlined.

Guideline 1. Label as non-interactive those sections of the protocols in which the teacher is recalling what he was saying or doing or what he had said or done, rather than what he was thinking.

Examples:

T: Then I told them they had good behavior . . . I've done that several times to reinforce good behavior.

T: I just started putting the words on the board.

Note 1: Statements indicating that the teacher saw, heard, or sensed what a student was saying or doing are to be coded as interactive since it is clear that the teacher was processing other people's behavior during that segment of the lesson.

Examples:

T: I didn't ask him what he wanted because I got the impression it wasn't very much.

T: I knew Chris was acting up. He always wants attention.

Note 2: When the teacher is describing or referring to a teaching strategy and his description contains reasons, purposes or consequences, then the data are to be coded as interactive.

Examples:

T: I thought I would just demonstrate a couple of examples just to refresh their minds about what we've been doing the last few days.

T: I know that children need to manipulate materials but I thought it would be faster if I did the demonstration myself in order to save time.

Guideline 2. Label as non-interactive those sections of the protocols in which the teacher is showing awareness of what he was doing rather than of what he was thinking.

Example:

T: Well I've been sort of watching myself more and I've been noticing, maybe, errors I've been making.

Guideline 3. Label as non-interactive those sections of the protocols in which the teacher is engaged in general discussion about teaching, situations in teaching that sometimes arose, and techniques that should or should not be used, where it is obvious that the discussion is not related to the interactive thoughts of the teacher.

Examples:

T: I don't over use praise, because I believe through over use it begins to mean nothing.

T: An underlying objective of mine is to become fairly close to the students, by doing things with them after school and finding out a little bit more about them as to what they do at home.

Guideline 4. Label as non-interactive those sections of the protocols in which it appears the teacher is providing a reason, explanation, or rationale for what he was doing or saying.

Example:

I: Why did you take that decision?
T: Probably the easiest, that's all and it was, I think, a rationalization. I was defending the fact that I should've looked at the test ahead of time.

Guideline 5. Label as non-interactive those sections of the protocols in which the teacher summarizes, restates, or reviews what he or the interviewer said previously.

Example:

I: That's the same boy?
T: It's the same boy, yes. And he seemed to take it in good stride.

Guideline 6. Label as non-interactive those sections of the protocols in which the teacher is engaged in general discussion about the background characteristics of pupils.

Example:

I: Do you think you gear your reaction to each youngster?
T: In some cases yes. Nancy over there, for example, needs more personal confidence and more self assurance, so if she mades an effort she gets praise regardless of her answer.

Guideline 7. Label as non-interactive those sections of the protocols where the teacher's consideration of a pre-instructional plan, decision, or state of mind did not occur during the lesson.

Example:

T: I had entered the lesson with that in mind, but I did decide that [to extend the lesson] once I saw how far we were in relation to how much time we had left . . . .

Guideline 8. Label as non-interactive those sections of the protocols where the teacher indicates any uncertainty about thoughts and feelings being interactive.

Example:

T: I'm not sure if I actually thought that at the time or not, but I do look about the room . . . .

Guideline 9. Where the teacher is repetitive and the original statement is elaborated and clarified, include the more specific statement in the interactive data.

Example:

T: The reaction was one of annoyance because they are supposed to put the books, all the books back in one particular place . . . so I was annoyed although I somehow didn't feel that annoyed, I didn't feel angrily annoyed, just annoyed.

Guideline 10. When classifying parts of the protocols as interactive or non-interactive, look for contextual clues. Often decisions about the nature of sections of the data can only be reached after examining clues found in lines prior, or subsequent, to the section under scrutiny. Context should be used to determine whether the use of present tense indicates reflection about an event or a reliving of the event.

Examples:

T: I am happy about Terri's questions, because it showed that she had been going over them the night before.

From context it is inferred that the teacher is saying that at the particular moment captured on videotape "I am happy . . . ."

> T: I did not really want to, because it's first thing in the day and it's going to be a hard thing to continue with.

Guideline 11. When in doubt, classify the section of the protocols in question as non-interactive.

Coding

Guetzkow (1950) identified two operations involved in coding. Applied to this study, this entails the processes of:

1. unitization or segmentation which consists of dividing the data source into ideational or thought units;
2. categorization, which involves placing each unit into one of several discrete, clearly defined categories.

Marland (1977:304) maintained that ". . . the distinction between the two stages of segmentation and categorization is blurred because the unit selection is best understood in terms of the categories. In fact, the categories largely establish the unit." This led King (1979:385) to suggest that in coding data, "the procedure to be used involves one of examining the transcripts and determining each unit on the basis of a section of the data complying with one of the categories of interactive thoughts. The unit is only established when a segment of the transcript matches with the charateristics of a category."

Unitization or segmentation. This consists of dividing the interactive data into thought or ideational units, which for this study have been defined as a remark or series of remarks which expresses a more or less complete idea and serves a specified function. In coding, each thought unit is delineated by being enclosed in parentheses.

Examples of unitization of teacher interactive thoughts:

I: What were your thoughts about the group that you were leaving or the group to which you were going?

T: (I thought that the group I'd left seemed to know what to do) and (they were quite settled) and (I thought they were ready to start their assignment). (The group I was coming to seemed quite reserved) and (they were busy doing comprehension skills) which they usually do in their moments when I'm not with them and they have some spare time.

Conners (1978:353) notes that in transcriptions of audiotapes, teacher's dialogue does not flow smoothly and contains "false starts" and "mazes" as two common speech characteristics. Because these do not express a more or less complete idea they do not meet the criteria of a single thought unit as defined. They are not to be unitized.

Examples of "false starts" (example underlined).

T: I was going to - I saw an error I had made.

T: . . . I was wondering, deciding, I was worried whether or not that was staying within the lines of the lesson.

Examples of "mazes" (example underlined).

T: I don't think they, I don't know, it was my questioning or whatever, I don't think I gave a good beginning . . . .

Categories. From examination of the protocols of the stimulated recall sessions, and consideration of the substance of the in-service experience, the following categories of teacher interactive thoughts have been created. These categories reflect the purpose of the research, are exhaustive and mutually exclusive. A thought unit can be categorized only once.

The ten categories of interactive thoughts and feelings are;

1. Instructional Strategies - Methodology. Interactive thoughts to be coded in this category have as their focus the conduct of the instructional aspect of the lesson. Teachers report thoughts concerning

the teaching techniques and strategies employed, planning, consideration of alternatives, pupil selection, monitoring, motivation and supervision. Thoughts indicating teacher evaluation of, or reflection on, the suitability or success of the strategies employed in the lesson are to be coded in this category while thoughts referring to the teacher's own performance in conducting the lesson are to be coded as Self Awareness.

Examples with relevant units of thought bracketed.

T: (I chose her because she had her hand up). (I sort of chose volunteers this morning). I thought the children had their hand up so (I thought I'd give them a chance).

T: (I thought I should correct him there).

T: (I sort of looked to see how many children had their hands up).

T: Well there weren't that many volunteers, as I said (the lesson was beginning to dwindle) (and it's because perhaps I'd spent too much time on the introduction). (I should have moved at a faster pace) (I didn't expect it to slow down).

T: (I was wondering, asking myself, "Do I spend too much time reading?")

2. Instructional Strategies - Classroom Management and Control. This category embraces teacher thoughts which occurred during the lesson related to the organization, management and control of the learning environment. These units reflect teacher concern for management, control and discipline, and strategies designed to achieve these. Thoughts reflecting evaluation of the strategies used in the lesson are to be coded in this category.

Examples with relevant units of thought bracketed.

T: Here the boy came up with his bus pass and he wanted me to put on his bus pass, (so I thought I'd do it) because sometimes he asks that in the middle of a lesson and (I thought I might as well do it now).

T: (I didn't want to pursue it any more). (I hoped that what I'd said would be sufficient).

T: (I was checking to see how much time we had left).

T: (I'm waiting for everyone to sit down before I start). (I don't want to be always nagging at them and saying sit down). I want them to settle down themselves.

T: Some were sharpening their pencils and (I wanted them to do this), (I want them to be ready for the lesson).

3. Instructional Strategies - Lesson Content. Units in this category reflect teacher thoughts centering on the subject matter of the lesson. The teacher is reporting thoughts concerning what has been, is being or will be taught. Reference may be made to curriculum, materials or resources. Goal statements or intended outcomes indicate thoughts related to the content of the lesson. Evaluative or reflective statements regarding the suitability, appropriateness or difficulty level of the subject matter are to be coded in this category. Thoughts related to methods or strategies for teaching the content are to be coded as Instructional Strategies - Methodology.

Examples with relevant units of thought bracketed.

T: (I was not only thinking of suffixes), I was worried about his writing.

T: Well this is a compromise because there was so much hesitation at this new abbreviation, (this tonne).

T: I knew they all wouldn't finish. I didn't care. (That wasn't the point); (that wasn't why they were doing the sheet).

4. Perceptions. Teacher reports of a sensory experience, involving what was seen, heard, noticed, felt (physically) or smelt during the lesson are to be coded as perceptions. A perception represents awareness. Units of thought to be coded as perceptions focus

on the actions of pupils in the learning environment and other features of that environment. Teachers' reports of self awareness are to be coded separately.

Examples with relevant units of thought bracketed.

T: . . . (he was putting all his new key tabs into his binder).

T: I chose Karen because she is quite good in math; to help. (She was one of the volunteers).

T: (I noticed that he hadn't been doing his work); (he was out of his desk).

T: (I thought I saw Murray go out for the second or third time). Now I think he did go out because (Michael had gone out).

5. Interpretations. Interpretations are interactive thought units in which the teacher attributes meaning or explanation to a perception. An interpretation is an inference that the teacher makes concerning a perception and may include judgment or evaluation. An interpretation is an abstraction while the perception on which it is based is concrete and observable. Interpretations may occur within a transcript without explicit reference to the perception. In such cases the perception is inferred. Evaluative comments regarding teaching methods, classroom management or lesson content are to be coded under Instructional Strategies.

Examples with relevant units of thought bracketed.

T: (They are responding better now) but it's a slow thing.

T: Another reason is that sometimes the list is quite long and (I suppose it becomes monotonous to them) and (they don't pay as careful attention).

T: (They were relatively attentive). I didn't hear them, (so I assumed that they were either getting the work out or working on the plan).

T: (I thought she just wasn't sure of herself).

T: (I don't think he prepared for it though) (because he didn't give me the right answer this time).

6. Pupil Information. Teacher interactive thoughts which focus on information about pupils individually, or of the class collectively, are to be coded as Pupil Information. Such knowledge or information includes thoughts about pupil personality, academic ability and performance, expectations for pupils, and family background. The accuracy of the pre-lesson information which the teacher integrates in the interactive situation is not an issue of concern.

Examples with relevant units of thought bracketed.

T: . . . (they're usually fairly good workers).

T: (He was one of the ones that generally achieves very well).

T: (I was generally expecting that sort of thing from him).

T: I chose that path because (that's where usually the talking and activity goes on) and I thought I'd check them first.

T: Well, (David is usually late) and (he always has some excuse why he's late).

T: Michael wasn't doing much and I thought I'd read the instructions to him . . . (he just likes to be told what to do). (He doesn't like reading at all). (He likes math and spelling and writing; the rest of the subjects he doesn't like).

7. Feelings. Interactive thought units in which the teacher reports emotions that were experienced during the lesson are to be coded as feelings. Reports about such affective states usually contain reference to a feeling or emotion such as annoyance, concern, surprise, guilt, or pleasure. Expressions of emotions related to the teacher's own teaching performance are to be coded as Self Awareness.

Examples with relevant units of thought bracketed.

T: (I was quite happy though) because she did have the method.

T: (I was a little annoyed with the noise).

T: (I was a little concerned with Janice).

T: (I was a little discouraged and disappointed) . . . .

T: (Well I thought, "I'm defeated").

T: (I guess I was indifferent really).

8. Self Awareness. In this category the subject of the teacher's thought is his own behavior as he interacts in the learning environment. The teacher may express awareness of his classroom performance, interaction with pupils, personal preparation or reflect on his personal characteristics, such as personality or appearance. Evaluative, reflective comments which focus on the teacher himself fall within this category.

Examples with relevant units of thought bracketed.

T: . . . it tended to continue that way as different questions came up and (I couldn't give a quick answer).

T: . . . frustration because (I'm still a little unfamiliar with the less commonly used prefixes).

T: . . . (I didn't realize that they [the text] were going to do all the different types of advertisements).

9. Beliefs. This category includes all units in which the teacher expresses thoughts about the characteristics of humans and human behavior particularly in relationship to classroom behavior and learning. Specifically these statements may make reference to general pedagogical beliefs, learning, motivation, discipline and classroom management.

Examples with relevant units of thought bracketed.

T: (I thought that everybody should try and have a chance at a reponse).

T: (I knew the children couldn't watch two places at once).

T: (I was thinking that I should always start with smaller numerals and work to larger ones) . . . .

T: (I think things have to be well spaced in order to be clear).

T: (I think if you do it in a verbal manner it just disturbs everyone) . . . .

10. Non-Task-Related. Interactive thoughts are thoughts which are unrelated to the events of the lesson, the lesson content, the instructional strategy, the learning environment and the people within it. Such thoughts may refer to investigator awareness, interruptions or non-concurrent events outside of the classroom situation.

Examples with relevant units of thought bracketed.

T: (I was worried again by the camera going on) (and as to the picture we were presenting as a class). (Also we were talking about the hockey game) and (I was also wondering if you were listening) . . . (and if you had seen the game).

T: (I was just preoccupied in a sense with something else).

T: (I was trying to think who it was that would be phoning).

Coding Guides

1. Using the guidelines provided, decide whether the data are interactive or non-interactive.
2. Place parentheses around each thought unit within the set of interactive data.
3. Assign each interactive thought unit to a category.

   Note: Coding guides 2 and 3 usually will occur concurrently.
4. Where repetitive interactive data are noted, unitize with the parentheses but not categorize. Mark with asterisks so as not to include them when quantifying the thought units.
5. Where one unit appears within another unit, place brackets around the inner unit and categorize separately.

APPENDIX H

FEATURES OF LESSONS VIDEOTAPED FOR STIMULATED RECALL

FEATURES OF LESSONS VIDEOTAPED FOR STIMULATED RECALL

The following lesson outlines were developed from:

1. notes maintained by the researcher while videotaping lessons;
2. coder notes recorded in the Classroom Activity Description section of the Observation Schedule;
3. teacher comments recorded in the protocols of the stimulated recall interviews.

Lesson 3.1 Language Arts - Vocabulary Development.

- instruction based on two ability groups for entire lesson.
- initial concern over class settling down.
- lesson interrupted by public address announcement.
- concern expressed by teacher over teaching strategy and lack of space on blackboard.
- some researcher awareness.
- late arrival of disruptive pupil.

Lesson 3.2 Mathematics - Multiplication using concrete materials.

- whole class instruction.
- disruption at beginning of lesson due to late arrival of pupils.
- pupils manipulating materials individually at desks.
- use of overhead projector by both teacher and selected pupils.
- teacher awareness of pupil distraction with materials, and pupil conversation.
- visitor to class; pupil rushed to answer door.
- lesson did not progress as planned; entire session devoted to review.

Lesson 3.3 Language Arts - Reading and vocabulary extension.

- instruction based on two ability groups for entire lesson; one group engaged with worksheet, other in oral reading.
- praise given to whole class for earlier good behavior.
- teacher awareness of coder.
- teacher enjoyment of the lesson content.

- self awareness of teaching style - speech and questioning techniques.
- inattentive behavior among less able group while teacher engaged with other group.

Lesson 3.4 Mathematics - Multiplication as repeated addition.

- delay at beginning as waited arrival and settling down of latecomers.
- whole class instruction using feltboard and overhead projector.
- widespread use of volunteers to demonstrate at feltboard.
- desk supervision as pupils worked on worksheets.

Lesson 3.5 Mathematics - Multiplication employing picture and story problems.

- discussion at beginning as teacher had been absent.
- delay in class settling to work.
- whole class instruction using feltboard and overhead projector.
- lesson interrupted by public address announcement.
- pupils demonstrating answers on feltboard.
- lesson was slow moving; inattention and disruptive behavior evident.

Lesson 3.6 Language Arts - Guided Reading.

- teacher anxious over the late return from recess by two boys.
- instruction based on two ability groups with less able engaged with set assignment.
- lesson interrupted by visit to the room by principal.
- teacher directly involved with more able group; inattentive behavior from others.
- excessive movement to washroom.
- teacher interrupted lesson to remove a game from three boys.

Lesson 3.7 Mathematics - Division as repeated subtraction.

- commenced lesson with poem.
- whole class instruction using chart and feltboard; pupils selected to demonstrate.

- teacher concern over restlessness and movement to washroom.
- teacher anxious regarding space on blackboard.
- late arrival of a pupil who had been absent for extended period.
- teacher engaged in desk supervision when pupils working on assignment.

Lesson 3.8 Language Arts - Reading.

- delay while waiting for class to settle after recess.
- instruction based on two ability groups for entire lesson.
- teacher alternated between the two groups for question sessions based on the reading assignment.
- less able group slow in settling to work; one pupil given a detention.
- lesson interrupted by a major public address annoucement which caused pupil reaction.
- increasing inattention and disciplinary moves.

Lesson 3.9 Mathematics - Multiplication; the product of two digit and one digit numerals.

- waiting for class to settle.
- whole class instruction; demonstration from blackboard with pupils having individual blackboards at their desks.
- public address announcement.
- disruptive behavior by one boy.
- desk supervision of individual work.
- interest centered on a treasure map puzzle.

Lesson 3.10 Language Arts - Vocabulary Development.

- teacher anxious over absence of pupils; teacher left the room in an attempt to find them.
- instruction based on two ability groups; group with which teacher not working engaged on set assignment.
- use of rapid-fire questioning to establish blackboard summary of relevant vocabulary.
- confusion and disruptive behavior as pupils attempt to arrange words alphabetically.

Lesson 6.1 Mathematics - Volume.

- whole class approach to instruction.
- considerable proportion of the lesson spent marking previous assignment.
- concept of volume introduced using a model.
- formula blackboarded.
- new work assigned; teacher worked with individuals at desks.

Lesson 6.2 Language Arts - Newspaper Reports.

- whole class approach to instruction.
- insufficient textbooks at outset of lesson.
- lesson closely based on textbook.
- slow lesson pace; limited pupil response, inattention.
- interruption for public address announcement.
- discussion concerning teacher's basketball fixtures.
- teacher awareness of researcher.
- late return of some pupils after recess.

Lesson 6.3 Mathematics - Volume.

- whole class approach to instruction.
- marking of revision material in preparation for review test.
- use of a model to help pupils experiencing difficulty conceptualizing the problems.
- teacher error and pupil reaction.
- inattentive behavior when assigned to individual assignments.
- public address message regarding a phone call for the teacher.

Lesson 6.4 Language Arts - Reading.

- whole class approach to instruction.
- introductory discussion of background material.
- pupils indicated the lesson had been completed with a substitute teacher.
- teacher continued with the lesson with minor modification from the plan outlined in the pre-instructional interview.
- teacher awareness of own reading style.

- teacher tried to use rapid-fire questioning to obtain greater pupil involvement.

Lesson 6.5 Mathematics - Review.

- whole class approach to instruction.
- at beginning of lesson general discussion focused on televised hockey game; teacher conscious of researcher.
- blackboarding of concepts; different lesson evolved from that which was planned.
- papers marked and results recorded; teacher had not previewed the test and was unprepared for one question; expression of frustration and sense of guilt.
- teacher reported being preoccupied over a misplaced document.

Lesson 6.6 Language Arts - Advertisements.

- whole class approach to instruction.
- new terms blackboarded and defined.
- material read from text and discussed.
- teacher reported not having previewed the material; several teacher questions were answered in subsequent sections.
- enthusiastic class response.
- lengthy public address announcement related to extra curricular activities organized by the teacher.
- several pupils returned late after recess; teacher annoyance.

Lesson 6.7 Language Arts - Figures of Speech.

- whole class approach to instruction.
- definitions blackboarded; teacher reported dissatisfaction with the definitions.
- confusions over use of worksheets; restless behavior when assigned to individual work.
- teacher concern over time available and noise level.
- public address announcement.

Lesson 6.8 Mathematics - Review of Decimalization.

- whole class approach to instruction.
- demonstration of calculations on blackboard.
- teacher reported inability to think of examples.
- involvement of large number of pupils through questioning.
- ambivalence over method of solving a problem; concern to avoid errors.
- verbal exchange with a new pupil in the class.
- private discussion with girl concerning out-of-school problem.
- marking of pupil work at teacher's desk
- teacher error and pupil tallying of errors.

Lesson 6.9 Mathematics - Metric measure.

- whole class approach to instruction.
- disturbed behavior from outset of the lesson; teacher returning after three day's absence.
- teacher reported awareness of researcher and coder.
- teacher reported lack of familiarity with the terms, confusion centered on the spelling of one of the terms.
- widespread off-task activity.

Lesson 6.10 Language Arts - Limericks.

- whole class approach to instruction.
- introduction to limericks; to rhyming pattern.
- several examples read to the class.
- pupils assigned task to write limericks.
- teacher circulated to assist individuals.
- off-task activity.
- teacher concern over noise level.

APPENDIX I

EXAMPLES OF BELIEFS CITED IN STIMULATED RECALL INTERVIEWS

EXAMPLES OF BELIEFS CITED IN STIMULATED RECALL INTERVIEWS

T3.1: I think everyone should have opportunity to answer.

T3.1: I think it maybe shows something in common [i.e. discussion of hobbies].

T3.1: I think they understand you more.

T3.1: I think their sentences are important. They are part of them.

T3.2: I think you have to try to find something positive so that you reinforce it.

T3.2: I think you have to treat them individually.

T3.2: I think they want to be liked.

T3.2: I should have mentioned it right at the beginning.

T3.2: If you continully raise your voise they turn you off.

T3.2: When you're handling discipline problems you should try to be calm.

T3.3: I think if you're negative, look for negative things, they become negative. If you look for positive things they become more positive.

T3.3: I don't think you can be at youngsters all the time for every little false move they do, but I think when it's disturbing the class, where it's interfering with the learning, I think you have to stop it.

T3.4: Something concrete is easier to remember I think for a child than something that's abstract.

T3.4: I know that children need to manipulate materials.

T3.4: I've been trying to say to myself that I should try and use words like "thankyou" and "please" because if I use them I think the children will use them.

T3.4: I should try and be a good model because the children imitate.

T3.5: Everyone likes to be praised. It's just that I think that some need it more than others.

T3.5: They do like to be touched I'm sure.

T3.6: I think little children need more written work perhaps; they need to see what they're doing.

T3.6: I try to stress order.

T3.6: . . . so I'd just leave him because it's only one individual and I don't think I should sacrifice the whole class for him.

T3.7: I should always start with smaller numbers and work to larger ones.

T3.7: I think things have to be well spaced in order to be clear.

T3.8: Some of them need more than oral cues [refering to need to put assignment on the blackboard].

T3.9: I don't think you can solve problems unless you follow those steps.

T3.9: Every week we have a new set of people doing jobs around the classroom. I think it gives them responsibility.

T3.9: I think that most children are cooperative and when you ask them to do something they do it.

T6.1: [Monitoring of desk work, making self available] I feel that's what we're supposed to do.

T6.2: I don't like to carry a sheet around [lesson notes]. I like to know what's coming in my mind, rather than having to refer to a book all the time.

T6.2: Well everyone is actually quite different.

T6.3: That way I don't have to get angry myself . . . when anybody yells at somebody the obvious reaction is for them to get uptight too.

T6.5: Your mood is always reflected in the classroom.

T6.6: I believe they do [look for praise], I'm told that they do and as a human being I can believe that.

T6.6: I shouldn't do that [ridicule and embarrass a pupil].

T6.9: I don't use it [criticism] a lot and I try not to use it at all.

T6.9: I don't over use praise, believing that over used it begins to mean nothing.

APPENDIX J

RATINGS ON HIGH INFERENCE VARIABLES

Teacher Three Variable 2: Teacher prevented misbehaviors from continuing.

		Rating on Five-Point Scale									
	Lesson	Language Arts					Mathematics				
		1	2	3	4	5	1	2	3	4	5
Pre In-service	1			v				v			
	2				v					v	
	3		x						x		
Post In-service (a)	4			x				v			
	5		v						x		
	6		v					v			
(b)	7				v				v		

			Rating on Five-Point Scale				
	Lesson	Total Lessons	1	2	3	4	5
Pre In-service	1	L. A.			v		
	2	Math.		v			
	3	L. A.				v	
	4	Math.				v	
	5	L. A.		x			
	6	Math.			x		
Post In-service (a)	7	Math.		v			
	8	L. A.			x		
	9	Math.			x		
	10	L. A.		v			
	11	Math.		v			
	12	L. A.		v			
(b)	13	Math.			v		
	14	L. A.				v	

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Three Variable 5: Teacher handled disruptive situations in a low-key manner (non-verbal, proximity, eye contact).

		Rating on Five-Point Scale									
	Lesson	Language Arts					Mathematics				
		1	2	3	4	5	1	2	3	4	5
Pre In-service	1			v					v		
	2				v					v	
	3			x						x	
Post In-service (a)	4			x					v		
	5				v				x		
	6				v				v		
(b)	7				v				v		

			Rating on Five-Point Scale				
	Lesson	Total Lessons	1	2	3	4	5
Pre In-service	1	L. A.			v		
	2	Math.			v		
	3	L. A.				v	
	4	Math.				v	
	5	L. A.			x		
	6	Math.				x	
Post In-service (a)	7	Math.			v		
	8	L. A.			x		
	9	Math.			x		
	10	L. A.				v	
	11	Math.			v		
	12	L. A.				v	
(b)	13	Math.			v		
	14	L. A.				v	

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Three Variable 12: Teacher used a variety of instructional techniques adapting instruction to meet learning needs.

		Lesson	Rating on Five-point Scale									
			Language Arts					Mathematics				
			1	2	3	4	5	1	2	3	4	5
Pre In-service		1				v					v	
		2			v							v
		3				x						x
Post In-service	(a)	4				x						v
		5			v							x
		6			v						v	
	(b)	7					v					v

		Lesson	Total Lessons	Rating on Five-Point Scale				
				1	2	3	4	5
Pre In-service		1	L. A.				v	
		2	Math.				v	
		3	L. A.			v		
		4	Math.					v
		5	L. A.					x
		6	Math.					x
Post In-service	(a)	7	Math.					v
		8	L. A.					x
		9	Math.					x
		10	L. A.			v		
		11	Math.				v	
		12	L. A.			v		
	(b)	13	Math.					v
		14	L. A.					v

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Three Variable 17: Teacher used techniques that provide for the gradual transition from concrete to more abstract activities.

		Rating on Five-Point Scale									
	Lesson	Language Arts					Mathematics				
		1	2	3	4	5	1	2	3	4	5
Pre In-service	1			v						v	
	2				v						v
	3					x					x
Post In-service (a)	4					x					v
	5					v					x
	6				v						v
Post In-service (b)	7					v					v

			Rating on Five-Point Scale				
	Lesson	Total Lessons	1	2	3	4	5
Pre In-service	1	L. A.			v		
	2	Math.				v	
	3	L. A.				v	
	4	Math.					v
	5	L. A.					x
	6	Math.					x
Post In-service (a)	7	Math.					v
	8	L. A.					x
	9	Math.					x
	10	L. A.					v
	11	Math.					v
	12	L. A.				v	
Post In-service (b)	13	Math.					v
	14	L. A.					v

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Three Variable 21: Teacher facilitated the smooth flow of the lesson or a smooth transition from one activity to another.

		Rating on Five-Point Scale									
	Lesson	Language Arts					Mathematics				
		1	2	3	4	5	1	2	3	4	5
Pre In-service	1				v					v	
	2				v						v
	3					x					x
Post In-service (a)	4				x						v
	5			v							x
	6				v					v	
Post In-service (b)	7					v					v

	Lesson	Total Lessons	Rating on Five-Point Scale				
			1	2	3	4	5
Pre In-service	1	L. A.				v	
	2	Math.				v	
	3	L. A.				v	
	4	Math.					v
	5	L. A.					x
	6	Math.					x
Post In-service (a)	7	Math.					v
	8	L. A.				x	
	9	Math.					x
	10	L. A.			v		
	11	Math.				v	
	12	L. A.				v	
Post In-service (b)	13	Math.					v
	14	L. A.					v

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Three Variable 29: The teacher used praise to reward outstanding work as well as to encourage pupils who were not always able to do outstanding work.

		Rating on Five-Point Scale									
	Lesson	Language Arts					Mathematics				
		1	2	3	4	5	1	2	3	4	5
Pre In-service	1									v	
	2			v					v		
	3				x					x	
Post In-service (a)	4				x					v	
	5	v								x	
	6		v						v		
Post In-service (b)	7			v						v	

	Lesson	Total Lessons	Rating on Five-Point Scale				
			1	2	3	4	5
Pre In-service	1	L. A.					
	2	Math.				v	
	3	L. A.			v		
	4	Math.			v		
	5	L. A.				x	
	6	Math.				x	
Post In-service (a)	7	Math.				v	
	8	L. A.				x	
	9	Math.				x	
	10	L. A.	v				
	11	Math.			v		
	12	L. A.		v			
Post In-service (b)	13	Math.				v	
	14	L. A.			v		

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Six Variable 6: Teacher insured assignments were interesting and worthwhile while children worked independently.

			Rating on Five-Point Scale									
		Lesson	Language Arts					Mathematics				
			1	2	3	4	5	1	2	3	4	5
Pre In-service		1			x					x		
		2		v					v			
		3		v					x			
Post In-service	(a)	4	v								v	
		5		v						v		
		6			x						x	
	(b)	7			v					v		

				Rating on Five-Point Scale				
		Lesson	Total Lessons					
				1	2	3	4	5
Pre In-service		1	Math.			x		
		2	Math.		v			
		3	L. A.			x		
		4	L. A.		v			
		5	Math.		x			
		6	L. A.		v			
Post In-service	(a)	7	Math.				v	
		8	L. A.	v				
		9	L. A.		v			
		10	Math.			v		
		11	L. A.			x		
		12	Math.				x	
	(b)	13	Math.			v		
		14	L. A.			v		

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Six Variable 8: Teacher optimized academic learning time. Pupils were actively involved and productively engaged in learning tasks.

			Rating on Five-Point Scale									
		Lesson	Language Arts					Mathematics				
			1	2	3	4	5	1	2	3	4	5
Pre In-service		1				x				x		
		2		v					v			
		3		v						x		
Post In-service	(a)	4		v					v			
		5	v							v		
		6		x							x	
	(b)	7				v				v		

				Rating on Five-Point Scale				
		Lesson	Total Lessons	1	2	3	4	5
Pre In-service		1	Math.			x		
		2	Math.		v			
		3	L. A.				x	
		4	L. A.		v			
		5	Math.			x		
		6	L. A.		v			
Post In-service	(a)	7	Math.		v			
		8	L. A.		v			
		9	L. A.	v				
		10	Math.			v		
		11	L. A.		x			
		12	Math.				x	
	(b)	13	Math.			v		
		14	L. A.				v	

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Six Variable 10: Teacher did not begin speaking to the group until all students were paying attention.

		Rating on Five-Point Scale									
	Lesson	Language Arts					Mathematics				
		1	2	3	4	5	1	2	3	4	5
Pre In-service	1			x					x		
	2				v				v		
	3				v				x		
Post In-service (a)	4				v					v	
	5				v					v	
	6				x				x		
(b)	7				v					v	

		Rating on Five-Point Scale					
	Lesson	Total Lessons	1	2	3	4	5
Pre In-service	1	Math.			x		
	2	Math.			v		
	3	L. A.			x		
	4	L. A.				v	
	5	Math.			x		
	6	L. A.				v	
Post In-service (a)	7	Math.				v	
	8	L. A.				v	
	9	L. A.				v	
	10	Math.				v	
	11	L. A.				x	
	12	Math.			x		
(b)	13	Math.				v	
	14	L. A.			v		

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Six Variable 12: Teacher used a variety of instructional techniques adapting instruction to meet learning needs.

		Rating on Five-Point Scale									
		Language Arts					Mathematics				
	Lesson	1	2	3	4	5	1	2	3	4	5
Pre In-service	1			x				x			
	2		v					v			
	3	v					x				
Post In-service (a)	4	v					v				
	5	v					v				
	6		x					x			
Post In-service (b)	7		v					v			

			Rating on Five-Point Scale				
	Lesson	Total Lessons	1	2	3	4	5
Pre In-service	1	Math.		x			
	2	Math.		v			
	3	L. A.			x		
	4	L. A.		v			
	5	Math.	x				
	6	L. A.	v				
Post In-service (a)	7	Math.	v				
	8	L. A.	v				
	9	L. A.	v				
	10	Math.	v				
	11	L. A.		x			
	12	Math.		x			
Post In-service (b)	13	Math.		v			
	14	L. A.		v			

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Six Variable 17: Teacher used techniques that provide for the gradual transition from concrete to more abstract activities.

		Rating on Five-Point Scale									
	Lesson	Language Arts					Mathematics				
		1	2	3	4	5	1	2	3	4	5
Pre In-service	1								x		
	2			v				v			
	3				v						
Post In-service (a)	4	v									
	5		v					v			
	6			x				x			
Post In-service (b)	7		v					v			

		Total Lessons	Rating on Five-Point Scale				
	Lesson		1	2	3	4	5
Pre In-service	1	Math.			x		
	2	Math.		v			
	3	L. A.					
	4	L. A.			v		
	5	Math.					
	6	L. A.				v	
Post In-service (a)	7	Math.					
	8	L. A.	v				
	9	L. A.		v			
	10	Math.		v			
	11	L. A.			x		
	12	Math.		x			
Post In-service (b)	13	Math.		v			
	14	L. A.		v			

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Six Variable 21: Teacher facilitated the smooth flow of the lesson or a smooth transition from one activity to another.

			Rating on Five-Point Scale								
		Lesson	Language Arts					Mathematics			
			1	2	3	4	5	1	2	3	4	5
Pre In-service		1				x					x	
		2			v					v		
		3				v					x	
Post In-service	(a)	4									v	
		5			v				v			
		6				x				x		
	(b)	7			v						v	

				Rating on Five-Point Scale				
		Lesson	Total Lessons	1	2	3	4	5
Pre In-service		1	Math.				x	
		2	Math.			v		
		3	L. A.				x	
		4	L. A.			v		
		5	Math.				x	
		6	L. A.				v	
Post In-service	(a)	7	Math.				v	
		8	L. A.					
		9	L. A.			v		
		10	Math.		v			
		11	L. A.				x	
		12	Math.			x		
	(b)	13	Math.				v	
		14	L. A.			v		

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Six Variable 24: Teacher was able to motivate children.

		Rating on Five-Point Scale									
		Language Arts					Mathematics				
	Lesson	1	2	3	4	5	1	2	3	4	5
Pre In-service	1				x				x		
	2		v					v			
	3		v						x		
Post In-service (a)	4		v							v	
	5	v							v		
	6		x							x	
(b)	7				v				v		

			Rating on Five-Point Scale				
	Lesson	Total Lessons	1	2	3	4	5
Pre In-service	1	Math.			x		
	2	Math.		v			
	3	L. A.				x	
	4	L. A.		v			
	5	Math.			x		
	6	L. A.		v			
Post In-service (a)	7	Math.				v	
	8	L. A.		v			
	9	L. A.	v				
	10	Math.			v		
	11	L. A.		x			
	12	Math.				x	
(b)	13	Math.			v		
	14	L. A.				v	

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Six Variable 26: Teacher responded accurately to both obvious and less obvious meanings, feelings, and experiences of the children.

		Rating on Five-Point Scale									
	Lesson	Language Arts					Mathematics				
		1	2	3	4	5	1	2	3	4	5
Pre In-service	1				x					x	
	2			v				v			
	3				v				x		
Post In-service (a)	4			v						v	
	5		v						v		
	6				x					x	
Post In-service (b)	7				v					v	

			Rating on Five-Point Scale				
	Lesson	Total Lessons	1	2	3	4	5
Pre In-service	1	Math.				x	
	2	Math.		v			
	3	L. A.				x	
	4	L. A.			v		
	5	Math.			x		
	6	L. A.				v	
Post In-service (a)	7	Math.				v	
	8	L. A.			v		
	9	L. A.		v			
	10	Math.			v		
	11	L. A.				x	
	12	Math.				x	
Post In-service (b)	13	Math.				v	
	14	L. A.				v	

Note: v. Videotaped lesson x. Lesson not videotaped

Teacher Six Variable 29: The teacher used praise to reward outstanding work as well as to encourage pupils who were not always able to do outstanding work.

		Rating on Five-Point Scale									
		Language Arts					Mathematics				
	Lesson	1	2	3	4	5	1	2	3	4	5
Pre In-service	1			x				x			
	2							v			
	3		v				x				
Post In-service (a)	4	v							v		
	5		v				v				
	6				x		x				
(b)	7		v					v			

			Rating on Five Point Scale				
	Lesson	Total Lessons	1	2	3	4	5
Pre In-service	1	Math.		x			
	2	Math.		v			
	3	L. A.			x		
	4	L. A.					
	5	Math.	x				
	6	L. A.		v			
Post In-service (a)	7	Math.			v		
	8	L. A.	v				
	9	L. A.		v			
	10	Math.	v				
	11	L. A.				x	
	12	Math.	x				
(b)	13	Math.		v			
	14	L. A.		v			

Note: v. Videotaped lesson x. Lesson not videotaped

APPENDIX K

DESCRIPTION OF CATEGORIES IN THE THREE MINUTE OBSERVATION (T.M.O.) SCHEDULE

DESCRIPTION OF CATEGORIES IN THE THREE MINUTE OBSERVATION (T.M.O.) SCHEDULE

Who

Indication of the pupil with whom the interaction takes place.

Grouping Mode

The teacher and pupils interact in the context of a one child mode, a small group, a large group, or whole class.

Teacher Initiated Interaction

Question Type

Product

Product questions seek a specific correct answer which can be expressed in a single word or short phrase. They do not involve the explanations built into process questions, and at the same time they do not provide the pupil with alternatives which include the correct answer, as in choice questions. Thus the pupil must either know the answer and verbalize it or take a guess by encoding an answer on his own.

Process

Process questions require the pupil to explain at length the cognitive or behavioral processes to be gone through in solving a problem or producing the correct answer to a question. They cannot be answered with a single word or a short phrase as is the case with product questions.

Choice

Two criteria distinguish choice questions:

i. the question deals with academic content and cannot be classified as a self-reference question;

ii. the teacher provides response alternatives, either verbally or by showing the pupil visual aids to look at in connection with the question, which includes the correct answer among them.

Self-reference

Questions that do not deal with factual matters but instead ask for the pupil's opinions, preferences, predictions, and personal experiences.

Pupil Selection

Pre-selected

Teacher nominates a pupil before asking a question.

Non-volunteer

Teacher asks a question but invites a response from a pupil who has not raised his hand.

Volunteer

Teacher asks a question first and invites a response from a pupil with hand raised.

Called out

Teacher asks a question but a pupil calls out the answer before the teacher has a chance to select a respondent, the teacher nevertheless responds to the pupil who called out the answer.

Quality of Child's Answer

A pupil's response is coded as being correct (+), partly correct (+-), wrong (-), "don't know", or no response. If the answer is called out be another pupil it is recorded as called out.

Teacher Response to Child's Answer

The teacher's reaction to the pupil's response has been categorized as terminal or sustaining.

Praise

The teacher communicates warmth, joy or excitement in her use of voice, words, or through non-verbal means as part of her feedback to a pupil's response.

Criticism

The teacher communicates anger, rejection, frustration, or direct verbal criticism by use of voice, words, or through non-verbal means as part of her feedback to a pupil's response.

Terminal

A reaction which is terminal has the effect of terminating the interaction with the pupil and could be one of the following:

Ignore

The teacher doesn't react or respond to the pupil's response other than to proceed to the next issue.

Affirm

The teacher indicates either verbally or non-verbally that the pupil has given a correct response.

Negate

Verbal or non-verbal indication that the pupil's answer is incorrect in whole or in part.

Process

The teacher explains why an answer is wrong or explains what to do in order to get the correct answer.

Gives Answer

The teacher provides the answer.

Sustaining

A reaction which is sustaining has the effect of prolonging the interaction, and can be one of three kinds. The teacher may repeat the question, rephrase it or give a clue (Rep. Q. Clue), ask a new question (New Q.) or repeat the pupil's answer (Rep. Ch. Ans.).

Child Initiated Interaction

Type of Interaction

A pupil, when initiating an interaction with the teacher, will either ask a Question or contribute a Comment. If the pupil calls out (Call Out) the question without prior teacher approval, this point is coded and also whether the question or comment was Relevant or Irrelevant to the ongoing discussion.

Teacher Response to Child Initiated Interaction

Two kinds of teacher reaction to the question or comment, praise (‡) and criticism (-), are coded if they occur, and also types of teacher feedback. The teacher may provide no feedback (0), Delay his answer, Accept or Not Accept it into the discussion, Integrate the question or comment into the ongoing discussion, or may use it to Shift the direction of the class discussion. The teacher may provide a Brief or Long response to the pupil's question or comment or he may Redirect it to another pupil.

Three other categories, praise (‡), criticism (-), and warning (Warn) are provided if the teacher makes a reaction to the pupil's behavior in initiating the question.